

International Climate Change Financing: Needs, Sources, and Delivery Methods

May 5, 2011

Congressional Research Service

<https://crsreports.congress.gov>

R41808

Summary

Many voices, domestic and international, have called upon the United States to increase foreign assistance to address climate change. Proponents maintain that such assistance could help promote low-emissions and high-growth economic development in lower-income countries, while simultaneously protecting the more vulnerable countries from the effects of a changing climate. Recent studies estimate the needs for climate change financing in the developing world to range from US\$4 billion to several hundred billion annually by the year 2030. The United States has pledged funds in such fora as the United Nations Framework Convention on Climate Change (UNFCCC, 1992), the Copenhagen Accord (2009), and the UNFCCC Cancun Agreements (2010), wherein the wealthiest countries, in aggregate, agreed to provide up to \$30 billion in “fast start” financing for the 2010-2012 period and to mobilize \$100 billion annually by 2020. Pledged funds are to come from a wide variety of sources, both public and private, bilateral and multilateral, including alternative sources of finance. Lower-income countries have sought assistance that is *new, additional to previous flows, adequate, predictable, and sustained*.

The fundamental dispute concerning international financing for climate change centers upon who should pay for it and how. The debate has been dominated by economic assessments of market-based mechanisms aimed at changing price incentives so that investment in low-emissions development becomes more attractive (e.g., cap and trade, carbon fees, loan guarantees). Many agree that private sector investment will likely have a significant role to play in any low-emissions future, and that establishing a price on GHG emissions will likely have a part in any effective policy agenda. However, concerns remain whether such mechanisms can induce the required shifts in production and consumption patterns, mobilize the necessary investment, and contribute adequately to international financial assistance. From this perspective, public funds—including from national governments and international organizations—continue to be a key driver for climate change investment, specifically in low-income countries.

Many methods for disbursing international climate change financing currently exist. All have a role in catalyzing climate action. They include private sector funding through such avenues as foreign direct investment (FDI), export credit markets, multilateral development banks and finance corporations, and the various U.N. Kyoto Protocol market mechanisms, as well as public sector funding through official development assistance (ODA), multilateral trust funds (e.g., the Global Environment Facility (GEF), Climate Investment Funds (CIF), Green Climate Fund (GCF)), and the concessional lending windows housed at the World Bank Group. Many contend that the financial architecture is underfunded, unnecessarily complex, and lacks both strategic mandate and adequate coordination. Debate has arisen over the proper financial instruments to employ in lower-income countries as well as the role shared by the public and private spheres.

Up to this point, the United States has relied mostly on direct budget appropriations to finance climate change actions internationally, but recent Congresses have considered several alternatives that could generate new financing for international purposes. Many in Congress and the public at large may question why the United States should help finance other countries’ efforts on climate change. Some claim that international financing would incur costs to the United States, or redirect funds that could be used for domestic purposes and send them overseas. Others, however, contend that international financing may offer potential benefits to the United States in terms of global environmental protection, expanded commercial markets, and increased national security.

Contents

Introduction	1
Perspectives on the U.S. Role in International Climate Change Financial Assistance.....	3
In Opposition.....	3
In Support.....	5
Cost Estimates for International Climate Change Activities	7
Findings.....	7
Methodology	9
Mitigation Costs: Net Costs	9
Mitigation Costs: Capital Intensity, or Up-Front Costs	12
Adaptation Costs.....	13
Total Costs for Mitigation and Adaptation Activities in Lower-Income Countries	15
Sources for International Climate Change Financial Assistance.....	16
Private Sector Sources.....	17
Public Interventions to Stimulate Private Sector Investment.....	19
Public Sector Sources.....	22
Innovative Finance	23
Voluntary Actions.....	24
Caveats Regarding Sources.....	25
Methods for Delivering International Climate Change Financial Assistance	26
Private Sector Mechanisms	27
Quasi-Private Sector Mechanisms	28
Public Sector Mechanisms	29
Bilateral: Official Development Assistance	32
Multilateral: International Financial Institutions	33
Caveats Regarding Mechanisms	35
U.S. Contributions to International Climate Change Financial Assistance	36
Congressional Authority, Oversight, Appropriations	36
Historical Contributions	40
FY2011 Enacted Budget Authority and the FY2012 Budget Request	41

Figures

Figure 1. Global GHG Abatement Cost Curve.....	11
Figure 2. Global Capital Intensity Cost Curve	13
Figure 3. Climate Vulnerability vs. Social Capacity	14
Figure 4. One Estimate of Annual Climate Change Financing Needed for Mitigation and Adaptation Activities in Lower-Income Countries, 2010-2020	16
Figure 5. Total Investment in Emissions-Related Economic Sectors in 2007	27

Figure C-1. Recent U.S Budget Authority and Requests for the Obama Administration's Global Climate Change Initiative by Agency and Category	51
--	----

Tables

Table 1. Various Estimates of Annual Climate Change Financing Needed for Mitigation and Adaptation Activities in Lower-Income Countries	8
Table 2. Examples of Bilateral and Multilateral Financing Mechanisms for Climate Change Mitigation and Adaptation Activities in Lower-Income Countries	30
Table 3. Historical U.S Budget Authority for International Climate Change Assistance by Agency and Program	38
Table 4. Recent U.S Budget Authority for International Climate Change Assistance by Agency and Program (Obama Administration)	42
Table A-1. Glossary of Finance Options	44
Table B-1. Considerations Concerning Sources of Climate Change Financing	46
Table C-1. Recent U.S Budget Authority and Requests for the Obama Administration's Global Climate Change Initiative by Agency and Category	51

Appendixes

Appendix A. Glossary of Options for Generating and Disbursing Financing to Address Climate Change	44
Appendix B. Comparison of Sources of Climate Change Financing	46
Appendix C. U.S. Global Climate Change Initiative	51

Contacts

Author Information	53
--------------------------	----

Introduction

While some investigators disagree with the current risk assessments of climate science, most accept the findings of the U.S. National Academies that the Earth's climate has changed over the past century and that human activities—particularly emissions of greenhouse gases (GHG) through such activities as fossil fuel use, agricultural practices, and deforestation—have very likely caused most of the observed effects.¹ Broadly agreed findings conclude that the world faces risks from the damaging effects of a changing climate unless GHG emissions are limited. There is some political consensus internationally to try to stabilize GHG concentrations in the atmosphere at approximately 450 parts per million by volume (ppm)² carbon dioxide-equivalent (CO₂e),³ a volume which is projected to limit global warming to around 2°C above pre-industrial levels. Some people argue that a 2°C target, if attained within a sufficient time frame, might prevent dangerous anthropogenic interference with the climate system, allow ecosystems to adapt naturally to climate change, ensure that food production is not threatened, and enable economic development to proceed in a sustainable manner.⁴ Others suggest different target levels of varying stringency.

Large-scale financial investments are projected to be needed to meet the global demand for energy, water, transportation, heating, and other infrastructure services in countries with growing populations and rising incomes. Financial requirements would be increased if countries made such investments with the additional consideration of addressing climate change. Proponents maintain that climate-relevant investments would promote low-emissions, high-growth economic development while simultaneously protecting the more vulnerable countries and communities from the effects of climate change. Some countries have begun to make moderate adjustments focusing, in particular, on energy efficiency strategies, low-emissions energy infrastructure, and sustainable land use, land use change, and forestry practices. However, despite expressions of concern and commitment, the shift toward climate-relevant investment has been deemed slow by many. Further, while industrialized countries continue to contribute a disproportionately large share of global GHG emissions, and historically have contributed most of the global GHG emissions over the past two centuries, future emission growth is projected to arise mostly from the developing world, whose populations and economic aspirations continue to grow. Thus, even if developed country emissions are significantly curtailed, climate targets may not be met without the deployment of similar abatement efforts in the developing world.⁵

¹ Studies include U.S. Global Change Research Program, *Global Climate Change Impacts in the U.S.*, 2009, at <http://globalchange.gov/publications/reports/scientific-assessments/us-impacts/key-findings> (accessed March 31, 2011); Intergovernmental Panel on Climate Change, *Climate Change 2007: Working Group I: The Physical Basis* (Cambridge, UK: Cambridge University Press, 2007); National Research Council, *Reconciling Observations of Global Temperature Change*, Board on Atmospheric Sciences and Climate (BASC) (Washington, DC: National Academy Press, 2000); National Research Council, *Climate Change Science: An Analysis of Some Key Questions* (Washington, DC: National Academies Press, 2001); National Research Council, *Abrupt Climate Change: Inevitable Surprises* (Washington, DC: National Academies Press, 2002). For background information on climate change science and impacts, see CRS Report RL33849, *Climate Change: Science and Policy Implications*, by Jane A. Leggett.

² In 2009, the CO₂e global average concentration in Earth's atmosphere was about 0.0387% by volume, or 387 ppm.

³ Carbon Dioxide Equivalent is a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). The greenhouse gases as defined by the UNFCCC include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and gases (such as chlorofluorocarbons, CFC) that are controlled under the Montreal Protocol to protect the stratospheric ozone layer.

⁴ These policies are in conformance with the United Nations Framework Convention on Climate Change (UNFCCC).

⁵ This report uses the terms “developing,” “developed,” “high-income,” “low-income,” “emerging,” “industrialized,” among others, to describe the economic and political development of countries. It should be noted that there is no

While there is little doubt that the most efficient GHG reduction strategy would require efforts from all countries, a fundamental dispute centers upon who should pay for them and how. Most, if not all, low-income countries have argued that their success in abating GHG emissions and curtailing deforestation would depend critically on receipt of international financial and other support. They argue that reducing their share of GHG emissions and adapting to the effects of climate change would incur costs above and beyond their normal economic growth trajectories. These costs are particularly challenging to countries that have low incomes compared to industrialized nations, consider alleviating poverty as their first priority, and conclude that they have contributed only a minor share of the historical GHG emissions that force climate change.

Higher-income countries, including the United States, have pledged financial assistance to lower-income countries in such fora as the United Nations Framework Convention on Climate Change (UNFCCC, 1992).⁶ While vaguely defined, the UNFCCC pledges are not voluntary commitments, but treaty obligations, signed and ratified by the U.S. government.⁷ More recently, the Copenhagen Accord (2009) stipulated—and the UNFCCC Cancun Agreements (2010) restated—that the wealthiest countries⁸ in aggregate would commit to provide up to \$30 billion “fast start” financing in the 2010-2012 period and to mobilize \$100 billion annually by 2020 to promote mitigation, adaptation, technology transfer, and capacity building efforts in lower-income countries. The funding is to come from “a wide variety of sources, [both] public and private, bilateral and multilateral, including alternative sources of finance.”⁹ The Copenhagen Accord is a non-binding political agreement among countries; the implementation of the Cancun

universally accepted definition or categorization of these terms. Many commentators note that divisions between these categories in climate-related literature are often arbitrary. Some commentators suggest that global economic development may best be represented as a spectrum of values as opposed to binary categories. Other analyses use the UNFCCC categories of “Annex I,” “Annex II,” “non-Annex I,” and “Least Developed” to refer to the income level of country Parties (see UNFCCC at http://unfccc.int/parties_and_observers/items/2704.php (accessed March 31, 2011)); however, it should be noted that the UNFCCC categories are based on 1992 OECD statistics that have since changed. Annex I countries currently include the United States, the 27 EU member states, Australia, Canada, Iceland, Japan, New Zealand, Norway, Turkey and Russia. All other nations are in the category of non-Annex I. This report will predominantly use the terms “higher-income” and “lower-income” in an effort to take note of the aforementioned concerns.

⁶ For background on the history of international climate change agreements, see CRS Report R40001, *A U.S.-Centric Chronology of the International Climate Change Negotiations*, by Jane A. Leggett.

⁷ United Nations Framework Convention on Climate Change, *Full Text of the Convention*, May 9, 1992, U.N.T.S., vol. 1771, No. 30822; S. Treaty Doc No. 102-38. See art. 4, § 3, which states: “Commitments: The developed country Parties and other developed Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under Article 12, paragraph 1 (i.e., the communication of information related to implementation including national emissions inventories, national communications of direction, etc.). They shall also provide such financial resources, including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures that are covered by paragraph 1 of this Article (i.e., national development priorities including emission inventories, mitigation and adaptation strategies, promotion of low-emission development, promotion of sustainable management, scientific cooperation, national communications, etc.) and that are agreed between a developing country Party and the international entity or entities referred to in Article 11, in accordance with that Article (i.e., the financial mechanism of the UNFCCC). The implementation of these commitments shall take into account the need for adequacy and predictability in the flow of funds and the importance of appropriate burden sharing among the developed country Parties,” at http://unfccc.int/essential_background/convention/background/items/1349.php (accessed March 31, 2011).

⁸ Which countries provide funds and in what amounts remains an element of negotiation.

⁹ See “Copenhagen Accord,” United Nations Framework Convention on Climate Change, Report of the Conference of the Parties on its fifteenth session, held in Copenhagen from 7 to 19 December 2009, Decision 2/CP.15, FCCC/CP/2009/11/Add.1, March 30, 2010, § 8, at <http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf#page=4> (accessed March 31, 2011).

Agreements, as a product of the UNFCCC Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA), is still under negotiation by Parties.

This report aims to inform congressional decision-making on U.S. provisions for financial assistance to low-income countries to address climate change. It proceeds by first framing some perspectives on the U.S. role in international financial assistance for climate change. It then addresses the following questions:

1. How much funding might be needed to address the problem?
2. What might the funding be used for?
3. Where might the funding come from?
4. How might the funding be delivered?

The final section of the report summarizes past and current U.S. contributions to international climate change initiatives.

Perspectives on the U.S. Role in International Climate Change Financial Assistance

Calls continue domestically and internationally for high-income countries to increase financial assistance to low-income countries to address climate change. Many in Congress and the public at large may question why the United States should help finance other countries' efforts to reduce GHG emissions or to adapt to climate variability and change. Some claim that international financing would incur costs to the United States, or redirect funds that could be used for domestic purposes and send them overseas. Others, however, contend that international financing may offer potential benefits to the United States in terms of environmental protection, expanded commercial markets, and national security.

Below is a brief outline of some of the arguments in support of and in opposition to the role of the U.S. government in foreign aid in general and international climate change assistance in particular.

In Opposition

Fiscal Constraints: Some critics of international climate change assistance to lower-income countries argue that the United States needs to retain available funds for domestic priorities, such as fostering renewed economic growth and creating jobs. They contend that the United States should not be burdened with higher taxes or prices for investments abroad.¹⁰ The burden is exacerbated during times of economic downturns, when governments are hard-pressed to generate fiscal resources to adequately address domestic challenges and maintain basic levels of public services and quality of life. For those who support some form of international development assistance, they may argue that aid should be directed to country priorities other than climate change, such as improving public health systems, water and sanitation resources, or infrastructure.

Misuse of Funds: Many critics have claimed that international financial assistance targeted to help average citizens in low-income countries often ends up supporting inefficient and bloated bureaucracies (e.g., recipient governments, donor-funded multilaterals, or non-governmental

¹⁰ "Americans want to cut foreign aid...to whom?" *The Economist*, April 9, 2010, 15:58 by M.S., at http://www.economist.com/blogs/democracyinamerica/2010/04/deficit_reduction (accessed March 31, 2011).

organizations). They argue that the national and international institutions that dispense financial assistance focus on “getting money out the door” to lower-income countries, rather than on delivering services; emphasize short-term outputs like reports and frameworks but do not engage in long-term activities like the evaluation of projects after they are completed; and put enormous administrative demands on lower-income country governments.¹¹ Bilateral and multilateral development agencies have also been criticized for the fragmentation of foreign assistance across many small and uncoordinated bureaucracies, the lack of transparency about project procurement practices and operating costs, and the proportion of funds that is misused or lost through instances of graft, corruption, and other political inefficiencies.¹²

Poor Results: Some critics contest the overall effectiveness of foreign assistance in spurring economic development and reform in low-income countries. Many studies have examined the effects of international assistance provided to lower-income countries, including both bilateral and multilateral mechanisms, and have returned mixed results. Conclusions range from ineffective,¹³ to highly effective,¹⁴ to effective “in some countries under specific circumstances.”¹⁵ The divergent results of these studies may make it difficult to reach firm conclusions and support continued contributions. Further, some commentators find that international environmental assistance poses even greater uncertainties than other forms of aid due to difficulties in assessing, measuring, reporting, and verifying environmental indicators. Some statistics have confirmed these perceptions, as the success rate for environmental projects is often far below those of education, health, or infrastructure.¹⁶

Development Inefficiencies: There is no satisfactory metric on the effectiveness of international financial assistance to lower-income countries. Some critics claim that it may do more harm than good.¹⁷ They assert that a reliance on foreign capital fosters an unhealthy economic dependence, making poor countries poorer and economic growth slower, and leaving recipients more debt-laden, inflation-prone, vulnerable to the vagaries of the currency markets, and unattractive to higher-quality investment. They claim that grant-based assistance as a platform for development is contradictory to sustainable economic growth and can squash private sector efforts in commercial markets. They claim debt-based assistance is worse, requiring loans to be repaid at the expense of recipient country’s education, health, and infrastructure investments. Further, large inflows of foreign capital may have the effect of killing off a country’s export sector by causing domestic currency to strengthen against foreign ones (referred to by economists as “Dutch Disease”). As a counter to the practice of international financial assistance, these commentators

¹¹ William Easterly, “The Cartel of Good Intentions,” *Foreign Policy*, vol. 131 (July-August 2002), pp. 40-49.

¹² William Easterly and Tobias Pfitze, “Where Does the Money Go? Best and Worst Practices in Foreign Aid,” *Journal of Economic Perspectives*, vol. 22, no. 2 (Spring 2008). For more on foreign aid reform, also see CRS Report R40102, *Foreign Aid Reform: Studies and Recommendations*, by Susan B. Epstein and Matthew C. Weed and CRS Report R40756, *Foreign Aid Reform: Agency Coordination*, by Marian Leonardo Lawson and Susan B. Epstein.

¹³ William Easterly, “Can Foreign Aid Buy Growth?,” *Journal of Economic Perspectives*, vol. 17, no. 3 (Summer 2003), pp. 23-48.

¹⁴ Carl-Johan Dalgaard and Henrik Hansen, “On Aid, Growth, and Good Policies,” *Journal of Development Studies*, vol. 37, no. 6 (August 2001), pp. 17-41.

¹⁵ Craig Burnside and David Dollar, “Aid, Policies, and Growth,” *American Economic Review*, vol. 90, no. 4 (September 2000), pp. 847-868.

¹⁶ Statistical studies of the effectiveness of environmental aid are scarce. One performed by the World Bank shows that only 25% of World Bank-financed environmental projects received a “satisfactory” project outcome rating, compared to 100% for education, 86% for health, and 87% for infrastructure (these figures are for the years 2001-2003). For a more complete discussion on the effectiveness of environmental aid, see Robert L. Hicks et al., *Greening Aid?: Understanding the Environmental Impact of Development Assistance*, (New York: Oxford University Press, 2008).

¹⁷ Dambisa Moyo, “Why Foreign Aid is Hurting Africa,” *The Wall Street Journal*, March 21, 2009, at <http://online.wsj.com/article/SB123758895999200083.html> (accessed March 31, 2011).

promote a strategy of development that emphasizes the role of entrepreneurship and private markets over an aid system based on cycles of transfer flows.

Lack of Consensus on Climate Science: Some critics point to scientific uncertainties and ambiguities within the fields of atmospheric chemistry and climatology as reasons to postpone and/or reconsider international climate change assistance policies and programs. They contend that the current scientific findings on climate change may not be sufficient to warrant government action, either domestic measures to mitigate GHG emissions and adapt to the effects of climate change or international policy actions and financial assistance to support other countries' efforts.

In Support

Commercial Interests: Some advocates argue that international climate change assistance to lower-income countries to support low-emission economic growth could benefit U.S. businesses through increased trade, commerce, and economic activity in the global marketplace. They contend that American clean energy and environmental management companies are well positioned to provide the innovative technology and services needed to meet the rapidly growing demand in emerging economies. Increased financing would not only promote development in the host country, but allow U.S. industries to make competitive inroads into rapidly expanding markets, improve the advancement and commercialization of U.S. technologies, mobilize greater investment in domestic sectors, and enhance job creation in the United States. Decreased funding may cede American influence in global markets to other economic powers still engaged with lower-income countries on environmental and natural resource issues (e.g., the European Union, China).

Investment Efficiencies: Some advocates claim that the costs of responding to tomorrow's climate-related catastrophes, instabilities, conflicts, and technological needs would be much higher than the costs of working today to prevent them through emissions reductions. "Each year of delay will lock in an increased amount of old [i.e., high-emissions] technology," according to the United Kingdom's Secretary of State for Energy and Climate Change.¹⁸ Economists often note that lower-income countries account for nearly all of the recent growth in global emissions and represent the cheapest opportunity to mitigate GHG pollution as part of a cost-effective solution. Additionally, some are concerned that locking in the developing world to a reliance on older, more GHG-intensive technologies during economic development may limit their flexibility and increase their costs to respond efficiently to future pollution abatement or climate resilient strategies. (Sometimes this is called a problem of "stranded capital.") Economists view some level of early investment as efficient, to hedge against these future risks.¹⁹

Natural Disaster Preparedness: Some advocates point to international climate change assistance as a means to assist in global disaster preparedness. They claim that recorded natural disasters continue to increase each year resulting in more casualties and mounting economic losses.²⁰ They assert that extreme weather events have led to increased droughts, food shortages, and resource competition, which, in turn, has led in some cases to population displacement and migration.

¹⁸ "Energy Ministers Endorse Clean-Tech Measures, Back CCS Group," *Greenwire*, July 20, 2010. <http://www.eenews.net/Greenwire/print/2010/07/20/4> (accessed March 31, 2011).

¹⁹ See, for example, Robert J. Lempert, Michael E. Schlesinger, and Steve C. Bankes, "When we don't know the costs or the benefits: Adaptive strategies for abating climate change," *Climatic Change* 33, no. 2 (6, 1996): 235-274.

²⁰ Munich RE Reinsurance, "Overall Picture of Natural Catastrophes in 2010," press release, January 3, 2011, at http://www.munichre.com/en/media_relations/press_releases/2011/2011_01_03_press_release.aspx (accessed March 31, 2011).

Some have proposed that increased international assistance to climate change adaptation programs could help avoid capital and other losses (e.g., buildings, infrastructure, etc.), minimize the redirection of strategic resources to ad hoc disaster response and urgent humanitarian needs, and avoid chronic humanitarian crises, such as food shortages, particularly for the resource poor in the least developed countries.²¹

National Security: Some advocates argue that international climate change assistance could help address risks to national security. According to a 2008 National Intelligence Assessment, the impacts of global climate change may worsen problems of poverty, social tensions, environmental degradation, and weak political institutions across the developing world.²² In October 2010, Chairman Mullen of the Joint Chiefs of Staff highlighted that climate change creates conditions “that could lead to failed states and make populations vulnerable to radicalization.”²³ Combating environmental drivers such as climate change, desertification, biodiversity loss, and deforestation could reduce the instability caused by the scarcity of, and potential competition for, resources like water, food, and habitat. Some see international financial assistance for climate change as a means to help make lower-income countries less susceptible to these threats, for the benefit of both the lower-income country and the security interests of the United States.

International Leadership: Some advocates contend that international climate change assistance to lower-income countries helps the United States improve its leadership in global environmental issues. Through leadership, the United States may be able to influence and set important international economic and environmental policies, practices, and standards. But leadership—apropos of voting share—is tied directly to the level of financial contribution in many multilateral organizations. Some believe that delivering on financial pledges is an important opportunity for the United States to demonstrate credibility and support negotiations not just on environment, but on economic and security issues as well. Withdrawing commitments may cede American influence in world affairs to other economic powers still engaged with lower-income countries on environmental and natural resource issues (e.g., the European Union, China). Weakened influence could manifest in challenges to political negotiations, economic relationships, trade preferences, and future collaborations.

International Obligations: Many advocates stress that the commitment to international climate change assistance to lower-income countries is codified in current multilateral agreements. Under the United Nations Framework Convention on Climate Change (UNFCCC), signed in 1992, the United States and other industrialized countries listed in Annex II of the Convention²⁴ committed

²¹ Both the World Bank and U.S. Geological Survey estimate that every dollar spent on disaster preparedness saves seven dollars in disaster response. The World Bank, *Natural Disasters: Counting the Cost*, March 2, 2004, at <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:20169861~menuPK:34458~pagePK:64003015~piPK:64003012~theSitePK:4607,00.html> (accessed March 31, 2011).

²² National Intelligence Council, *National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030, Statement for the Record by Dr. Thomas Fingar, Deputy Director of National Intelligence for Analysis, National Intelligence Council, before the U.S. Congress, House Permanent Select Committee on Intelligence & House Select Committee on Energy Independence and Global Warming*, June 25, 2008, at http://www.dni.gov/nic/special_climate2030.html (accessed March 31, 2011).

²³ Joint Chiefs of Staff, *JCS Speech: Energy Security Forum*, as delivered by Admiral Mike Mullen, chairman of the Joint Chiefs of Staff, Washington, DC, Wednesday, October 13, 2010, at <http://www.jcs.mil/speech.aspx?id=1472> (accessed March 31, 2011).

²⁴ Annex I countries currently include the United States, the 27 EU member states, Australia, Canada, Iceland, Japan, New Zealand, Norway, Turkey and Russia. All other nations are in the category of non-Annex I. Annex II Parties include the industrialized countries that were members of the OECD (Organization for Economic Co-operation and Development) in 1992, but not the countries with economies in transition (the EIT Parties), including the Russian

to provide financial and technical assistance to help lower-income countries' efforts to meet their UNFCCC obligations. While these commitments are legally binding, they are vaguely defined, making them impractical to quantify and enforce. More recent negotiations have striven to produce more quantified figures, and the Copenhagen Accord of 2009 produced an agreement by the wealthiest countries to provide \$30 billion of "fast start" financing in the period 2010 to 2012 and to seek \$100 billion annually by 2020.²⁵ However, these financial targets are not legally binding, and accounting and enforcement remain difficult.

Equity Issues: Some advocates consider international climate change assistance to lower-income countries a moral responsibility and a matter of climate equity. Not only have today's high-income economies generated about 80% of past fossil fuel-based emissions, but those same emissions have helped carry them to high levels of social and economic well-being. Past behavior arguably calls for the industrialized countries to provide funding to reduce the current and future risks imposed on others.

Cost Estimates for International Climate Change Activities

The financial costs of coping with climate change may reach trillions of dollars. These costs would aim to address some combination of mitigation activities (i.e., actions taken to eliminate or reduce the long-term risk and hazards of climate change) and adaptation activities (i.e., actions taken to adjust to climate change, moderate potential damage, or cope with the consequences). Estimates of the projected costs vary widely depending upon assumptions made about the accepted levels of pollution, the ambitiousness of the global response, its structure, timing, and implementation, the potential climate-related damages, the affected sectors, as well as the methods of sourcing and delivering the necessary funds. The stricter the emissions target, the higher the estimate. The longer the response is delayed, the more threatening the damages may be, and the greater the resources required to respond to the threats. Bearing the costs of action (or inaction) are individuals, firms, local communities, national governments, and/or the international community.

Findings

A variety of international institutions and non-governmental organizations have used various climate change mitigation and adaptation analyses to estimate the climate-related financing needs for lower-income countries.²⁶ **Table 1** reports findings from a variety of studies on both the "net costs" and "associated financing requirements" for mitigation and adaptation efforts in lower-income countries. "Mitigation costs" refer to net incremental costs as factored over the lifecycle of the investment; and "mitigation financing" refers to the up-front capital investment needed over and above the business-as-usual (BAU) investment. Both mitigation costs and mitigation financing are estimated for stabilizing atmospheric concentrations at 450 ppm CO₂e; adaptation investments are estimated for a variety of assistance categories for both 2010 and 2030.

Federation, the Baltic States, and several Central and Eastern European States.

²⁵ UNFCCC, *Decision 2/CP.15*, op. cit.

²⁶ This section presents the findings on various cost estimates for mitigation and adaptation needs in lower-income countries. The following section, "Methodology," discusses in greater detail the economic assumptions and modeling behind the various estimates.

Focusing on the 450 ppm target, mitigation net costs in lower-income countries range between \$150 billion and \$190 billion a year by 2030. If the estimates for associated financing needs are included, the total costs increase to \$287 billion to \$614 billion a year. For adaptation, the most comparable estimates are the medium-term figures produced by the UNFCCC and the World Bank, which range from \$30 billion to \$110 billion annually.

Currently, resources committed to address mitigation and adaptation in lower-income countries cover approximately 5% of the aforementioned estimates. One recent study has contributions for mitigation-specific assistance at approximately \$20 billion annually. Very few studies have addressed current contributions for adaptation assistance.²⁷ Many claim that assessing climate-related financial and investment flows is a formidable challenge, given the inconsistencies across reporting systems, the many data gaps (with the further challenge of identifying the contributions of underlying finance, which unlike specific climate finance is not reported as such), and the complex web of flows (with the possibility of double counting).

Table I. Various Estimates of Annual Climate Change Financing Needed for Mitigation and Adaptation Activities in Lower-Income Countries

In Constant 2008 US\$ Billions

Sources of Estimates	Estimate 2010-2020	Estimate 2030	Details
Mitigation Costs			
Project Catalyst (2009)	45	—	See Figure 4 below
McKinsey & Co. (2009)	—	190	Total costs if pursuing the most economically rational abatement opportunities to their full potential with transaction and program costs
Pacific Northwest National Laboratory (PNNL) (2008)	—	151	—
Mitigation Financing			
Project Catalyst (2009)	70-100	—	See Figure 4 below
McKinsey & Co. (2009)	326	612	Total upfront investment needed incremental to business-as-usual (BAU)
International Institute for Applied System Analysis (IIASA) (2009)	68-179	287	—
International Energy Agency (IEA), Energy Technology Perspectives (2008)	—	614	Annual averages through 2050
Adaptation Costs			
World Bank (2009)	10-45	—	Cost of climate-proofing development assistance, foreign and direct investment

²⁷ For a discussion of contributed estimates, see Jan Corfee-Morlot et al., *Financing Climate Change Mitigation: Towards a Framework for Measurement, Reporting, and Verification*, Organisation for Economic Cooperation and Development, October 2009; and World Bank, *Monitoring Climate Finance and ODA*, Issue Brief #1, May 2010.. OECD DAC introduced a system of monitoring aid that targets the objectives of the Rio Conventions (Rio Markers) in 2008 for mitigation and in 2010 for adaptation. The markers identify aid activities that contribute to the objectives of the UNFCCC. Partial data indicate that over the past few years DAC donors have allocated \$3 billion to \$4 billion per year for mitigation-related aid (about 3%-4% of total ODA). Other aid has been transferred via the UNFCCC Clean Development Mechanism (CDM) as well as through debt instruments at the Multilateral Development Banks (MDB).

Sources of Estimates	Estimate 2010-2020	Estimate 2030	Details
United Nations Development Program (UNDP) (2008)	90-114	—	Cost of climate-proofing development assistance, foreign and direct investment, plus cost of poverty reduction strategies and disaster relief programs
Stern Review (2006)	4-40	—	Cost of climate-proofing development assistance, foreign and direct investment
World Bank EACC (2009)	—	82-110	Average annual adaptation costs from 2010 to 2050 in the agriculture, forestry, fisheries, infrastructure, water resource management, and coastal zone sectors, including impacts on health, ecosystem services, and the effects of extreme weather events
Project Catalyst (2009)	—	16-40	2030 cost of capacity building, research, disaster management and the UNFCCC sectors (most vulnerable countries and public sector only)
UNFCCC (2008)	—	30-73	2030 cost in agriculture, forestry, water, health, coastal protection, and infrastructure

Sources: Project Catalyst, *Toward a Global Climate Agreement: Synthesis Briefing Paper*, June 2009; and World Bank, *World Development Report: 2010: Development and Climate Change*, 2009, with data for mitigation sourced from IIASA, 2009 and additional data provided by V. Krey; IEA, 2008; McKinsey & Company, 2009, and additional data provided by McKinsey (J. Dinkel) for 2030, using a dollar-to-Euro exchange rate of \$1.25 to €1.00; PNNL figures from Edmonds and others, 2008, and additional data provided by J. Edmonds and L. Clarke; and for adaptation sourced from Agrawala and Fankhauser, *Economic Aspects of Adaptation to Climate Change: Costs, Benefits, and Policy Instruments*, OECD, 2008, except World Bank EACC, *Economics of Adaptation to Climate Change*, 2009.

Notes: Estimates are for stabilization of greenhouse gases at 450 ppm CO₂e, which would provide a 40%-50% chance of staying below 2°C warming by 2100. All figures have been adjusted to 2008 US\$ in billions using U.S. Bureau of Economic Analysis (BEA) Gross Domestic Product (GDP) Deflator and a dollar-to-Euro exchange rate of \$1.25 to €1.00.

Methodology

Estimates of the total net costs and financing requirements needed for mitigation and adaptation activities in lower-income countries are often based on economic models of pollution abatement costs and/or adaptation investments aggregated across sectors and regions. This section discusses in more technical detail the economic modeling behind the various cost estimates presented in the previous section. Due to characteristic differences, estimates of net costs and financing requirements are often differentiated between the costs of *mitigation* and the costs of *adaptation*.

Mitigation Costs: Net Costs

Mitigation costs refer to the costs of actions taken to reduce or reverse the forces that contribute to global climate change. In higher and lower-income countries alike, mitigation measures aim to reduce current levels of emissions and to emphasize low-GHG development. Strategies include transitioning to a low-emissions energy supply; capturing the opportunities in energy efficiency improvements in buildings, transportation, and industry; reducing deforestation and improving sustainable forest management to better serve as GHG emissions sinks; and employing more low-emissions and sustainable agriculture practices. In the future, it could also entail actions that

remove carbon dioxide from the atmosphere and sequestering it permanently, or other geoengineering²⁸ technologies.

Estimates have been made of the incremental costs²⁹ of various mitigation strategies. **Figure 1** shows one example of what analysts refer to as an “Emissions Abatement Cost Curve.” The purpose of the curve is to summarize the many emission reduction strategies available, and to characterize their emission reduction potential as well as their net costs, if the strategy is “pursued aggressively.” The curve charts the amount of potential reductions (expressed along the horizontal axis in gigaton³⁰ of CO₂e abated per year) against the cost of specific measures (expressed along the vertical axis in cost per ton of CO₂e abated).³¹ Of particular note, the curve shows that many abatement opportunities exist with net negative costs (approximately one-third of potential reductions), meaning that the measures may pay for themselves within the useful lifetime of the investment through efficiency savings (e.g., switching from incandescent light bulbs to LEDs would both reduce emissions and save money in the long run due to the extended product life and energy efficiency of LEDs). These negative cost options (shown on the left of the graph) are mainly found in energy efficiency measures in building, transportation, and industry as well as some fuel switching, recycling, and waste management practices. For emission reduction strategies in the agriculture and forestry sectors (e.g., improved agriculture practices, afforestation, reforestation),³² most options have low to moderate costs. Many of the low to moderate cost options fall within the curve’s margin for error and are arguably breakeven estimates. Sectors with relatively high cost reduction opportunities are in some energy production options, with some emerging technologies having even higher costs than are represented on the graph given their nascent state of development.

²⁸ Geoengineering technologies, applied to the climate, aim to achieve large-scale and deliberate modifications of the Earth’s energy balance in order to reduce temperatures and counteract anthropogenic (i.e., human-made) climate change. For a detailed examination of geoengineering, see CRS Report R41371, *Geoengineering: Governance and Technology Policy*, by Kelsi Bracmort, Richard K. Lattanzio, and Emily C. Barbour.

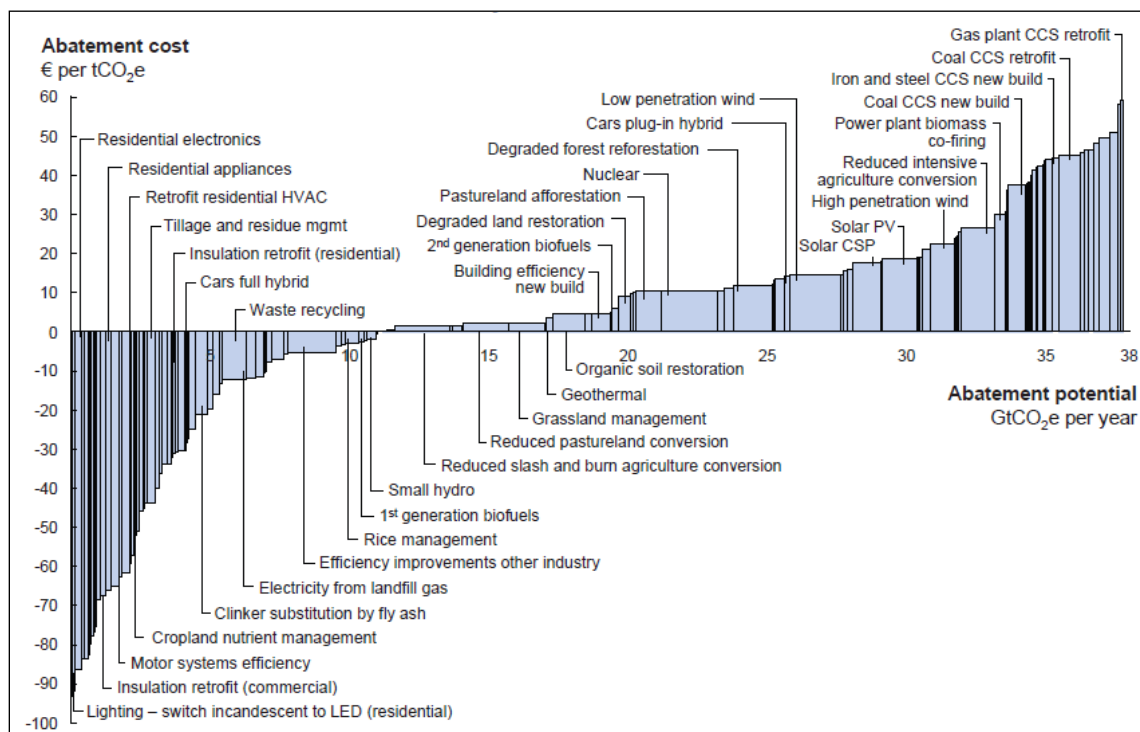
²⁹ “Incremental costs” refer to costs above and beyond the costs of a “business-as-usual” strategy. For example, the incremental cost of a proposed wind farm for electricity generation would be the cost of the wind farm above and beyond the cost of a coal-fired generation plant that produced a comparable amount of electricity. For the purposes of this report “incremental costs” and “additional costs” will be used interchangeably.

³⁰ A gigaton is equivalent to 1 billion tons.

³¹ McKinsey & Company, *Pathways to a Low-Carbon Economy, Version 2 of the Global Greenhouse Gas Abatement Cost Curve*, 2009, p. 7. Reading the curve: “the width of each bar represents the potential of that opportunity to reduce GHG emissions in a specific year compared to the business-as-usual development (BAU). The potential of each opportunity assumes aggressive global action starting in 2010 to capture that specific opportunity, and so does not represent a forecast of how each opportunity will develop. The height of each bar represents the average cost of avoiding 1 ton of CO₂e by 2030 through that opportunity. The cost is a weighted average across sub-opportunities, regions, and years. All costs are in 2005 real Euros. The graph is ordered left to right from the lowest-cost abatement opportunities to the highest-cost. The uncertainty can be significant for individual opportunities for both volume and cost estimates, in particular for the Forestry and Agriculture sectors, and for emerging technologies.”

³² “Afforestation” refers to the planting of trees on areas that are not covered with forests. “Reforestation” refers to the re-planting of trees on areas that were once covered with forests.

Figure I. Global GHG Abatement Cost Curve
Beyond Business-as-Usual for 2030



Source: McKinsey & Co, *Pathways to a Low-Carbon Economy*, v.2.0, 2009.

Notes: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO₂e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.

Figure 1 demonstrates that ideally if all possible mitigation measures were taken on the cost curve in strict order from lowest-cost to higher-cost in sequence (i.e., from replacing all residential incandescents with LEDs all the way up to retrofitting all coal-fired power generation with carbon capture and storage technologies), global emissions abatement of 38 GtCO₂e could be achieved in 2030.³³ At this rate, the average cost of the abatement opportunities would be \$5 per tCO₂e in 2030, and the total cost for realizing the whole curve would be \$187.5 billion in the year 2030. Transaction and program costs—not represented on the curve—are often estimated at an average of between \$1.25 and \$6.25 per tCO₂e abated, making the total annual global cost approximately \$250 billion to \$375 billion by 2030.³⁴ While an abatement cost of \$6 to \$12 per tCO₂e is reasonable in light of current economic discussions on climate change, many commentators stress that mitigation costs are extremely sensitive to policy choices. They increase steeply with the stringency of the emission reduction target and with the desired degree of certainty of reaching it. Global mitigation costs would likewise rise to the degree that the world deviates from a least-cost emission pathway (e.g., not tapping low cost reductions in lower-income countries in the initial mitigation effort would increase global costs significantly). Further, the failure to allow for all mitigation opportunities would likewise increase overall costs (e.g., only concentrating on energy efficiency measures and not on forest and agricultural management could increase overall costs).

Mitigation Costs: Capital Intensity, or Up-Front Costs

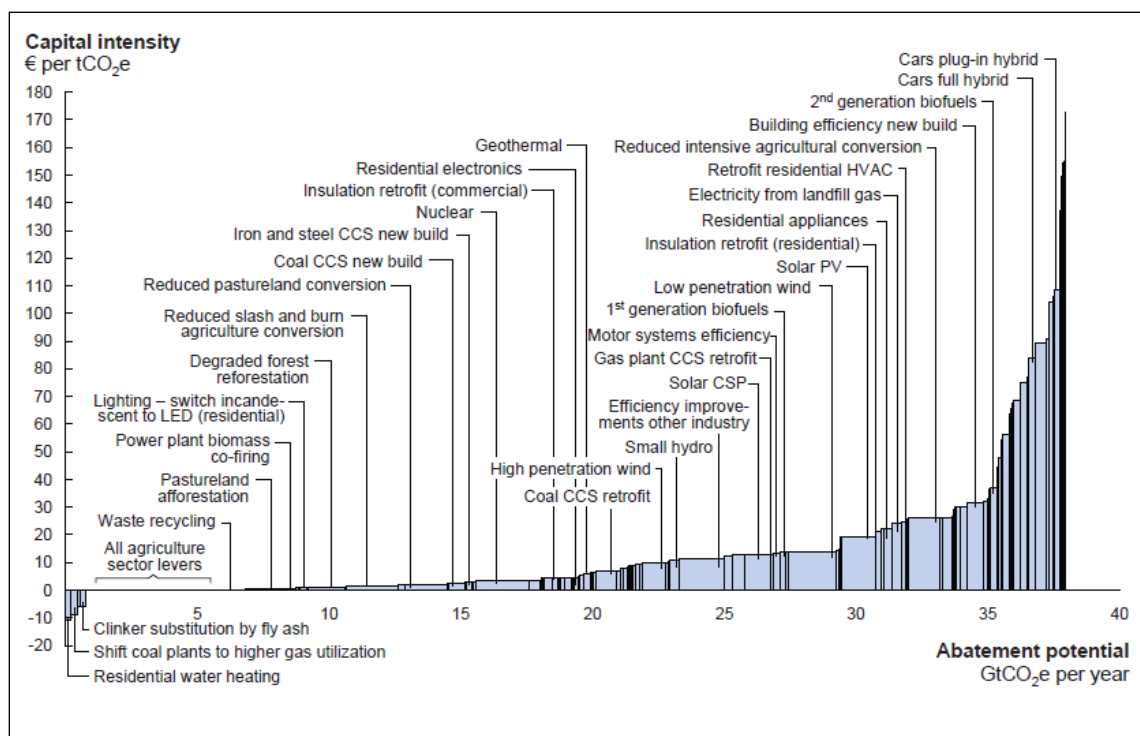
Many commentators note that low-emission investments for mitigation activities often have high up-front capital costs, followed later by overall savings in operating costs.³⁵ **Figure 2** charts the incremental capital needs, or “capital intensity costs” (i.e., the extra investment needed at the onset of a project over and above the business-as-usual (BAU) technologies), as an alternative metric to the net cost curve of **Figure 1** (which charts the additional net costs of a low-emission project *over its entire lifetime*). **Figure 2** shows that in some cases the difference between capital intensity costs and net costs can be as much as a factor of two to four, depending on the rate of opportunity costs assumed. The McKinsey & Company estimate concludes that the total global upfront investment needed for abatement measures would be \$1,012.5 billion per year in 2030—incremental to BAU investments. For financially constrained countries, specifically many lower-income countries, these high up-front capital costs can be a significant disincentive to invest in low-emission technologies.

The McKinsey & Company estimate outlined above is just one of many assessments conducted on financial needs. See **Table 1** above for other mitigation cost estimates from a variety of studies.

³³ The abatement figure of 38 GtCO₂e in 2030 is relative to BAU emissions of 70 GtCO₂e, which is equivalent to 35% and 40% decrease from 1990 levels, the reference year for the Kyoto Protocol and many current discussions, and sufficient to having a moderate chance of holding global warming below 2 degrees Celsius.

³⁴ These estimates use constant 2008 US \$ from McKinsey & Co. with a dollar-to-Euro exchange rate of \$1.25 to €1.00.

³⁵ Take for example wind or solar power generation. These technologies have significantly higher up-front capital costs compared to more traditional coal- or natural gas-fired generation due to technical and material costs; however, once a wind or solar power generator has been build or installed, the operating costs are significantly lower, due in no small measure to the fact that its fuel source is renewable and does not need to be purchased.

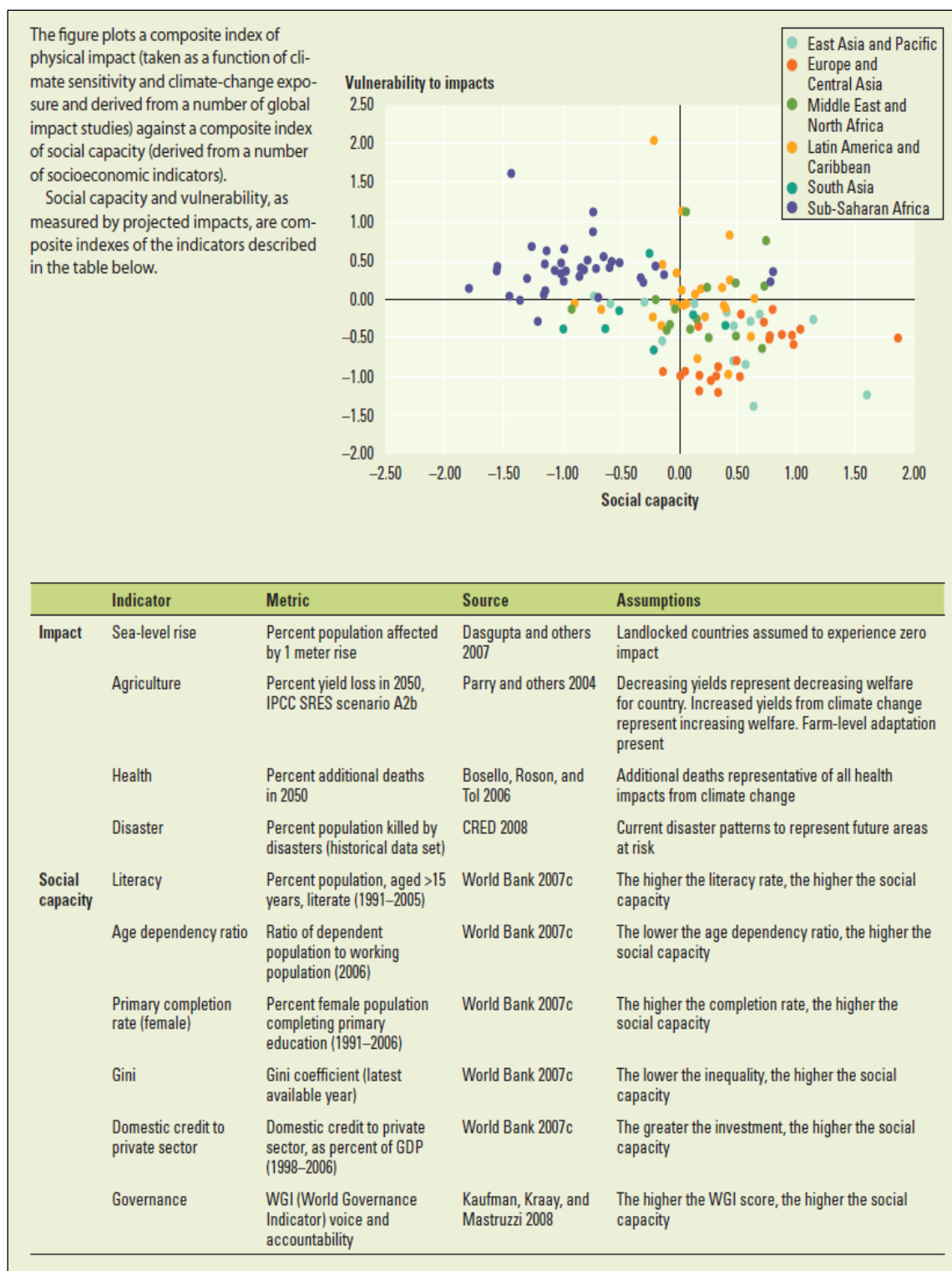
Figure 2. Global Capital Intensity Cost Curve

Source: McKinsey & Co, *Pathways to a Low-Carbon Economy*, v.2.0, 2009

Notes: The capital intensity of an abatement measure is defined as the additional upfront investment relative to the BAU technology, divided by the total amount of avoided emissions over the lifetime of the asset. For a more fuel efficient car, for instance, the capital intensity would be calculated as the additional upfront investment compared to the BAU technology, divided by the amount of CO₂ saved through lower fuel consumption during the lifetime of the car. The main difference with abatement cost is that the capital intensity calculation does not take financial savings through lower energy consumption into account.

Adaptation Costs

Adaptation costs refer to the costs of adjustments made in natural or human systems in response to actual or expected climate change and its effects. Estimates of adaptation costs have focused on the additional amount of investment needed to reduce the impact of anticipated future damages caused by climatic trends or events, including measures to increase resilience, reduce the impacts of anticipated disasters, and cope with the aftermaths. Examples of adaptation measures include employing climate-resistant crop varieties, improving irrigation systems, integrating sustainable land management into agricultural planning, protecting water resources, managing coastal zones, designing infrastructure for extreme weather or for sea-level rise, and improving public health services.

Figure 3. Climate Vulnerability vs. Social Capacity

Source: World Bank, *World Development Report 2010: Development and Climate Change*, 2009.

From a global perspective, the adaptation challenge may be greatest in the developing world. Lower-income countries are generally more vulnerable to climate change because their economies are more dependent on climate-sensitive sectors such as agriculture, fishing, and tourism. Further, with lower per capita incomes, weaker institutions, and limited access to technology, lower-income countries are considered to have less adaptive capacity. See **Figure 3** for one analysis of vulnerability and social capacity by country and region. The figure shows that in many cases a lower social capacity (as measured by literacy, education, health, and governance indexes) may make countries more vulnerable to the impacts of climate change.

Estimating the costs of adaptation with precision is difficult, not only because adaptation measures are widespread and heterogeneous, but also because the measures are embedded in the broader network of economic development strategies. While any investment in education, health, sanitation, and security, for example, may constitute good development, it also may help reduce socioeconomic vulnerability to both climactic and non-climactic stress factors. A variety of studies have tried to estimate the incremental costs of adaptation in low-income countries. Methods, definitions, and scopes of adaptation in these studies vary, accounting for many of the differences in cost estimates.³⁶ In particular, many estimates assume that some portion of the incremental costs will be covered by the recipient countries themselves. Some studies attempt to consider “all” costs of adaptation to climate change and resulting damages (although none are comprehensive); some include just large-scale adaptation costs (i.e., not private measures taken by individuals); and some try to discern just the need for public financing for adaptation. The UNFCCC Secretariat estimates that the additional annual investment and financial flows needed worldwide would be on the order of \$49 billion to \$171 billion by 2030, with \$30 billion to \$73 billion needed for lower-income countries (the largest element of uncertainty in the UNFCCC estimate lies in the cost of infrastructure adaptation). Other sources have produced varying estimates. See **Table 1** above for adaptation cost estimates from a variety of studies.

Total Costs for Mitigation and Adaptation Activities in Lower-Income Countries

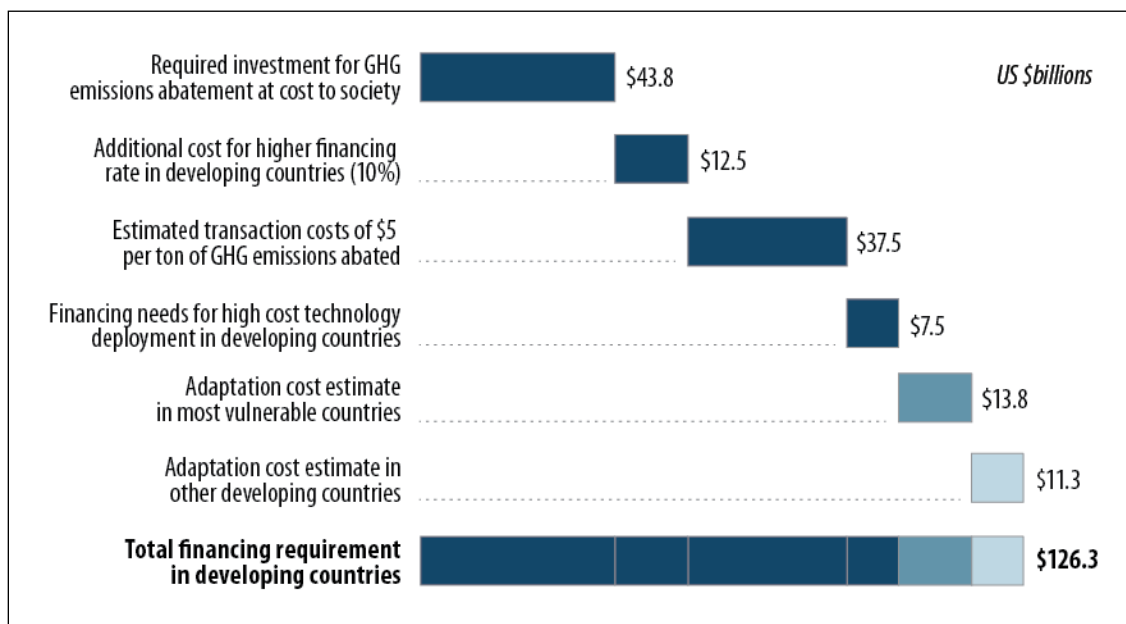
A variety of international institutions and non-governmental organizations have used various climate change mitigation and adaptation analyses to estimate the climate-related financing needs for lower-income countries. One example by Project Catalyst (**Figure 4**) sums the incremental costs for the period 2010-2020 to give an average total of \$45 billion per year for mitigation needs in lower-income countries. Factoring in a higher rate of investment in lower-income countries and covering transaction costs and specific funding for emerging technologies brings the total financing requirement for abatement in lower-income countries to around \$100 billion annually. Including projections for the additional costs of adaptation activities gives a final estimate of \$126 billion per year for the period 2010-2020 in lower-income countries.³⁷

³⁶ When assessing costs of adaptation activities, terms like “climate-proofing development” and “disaster relief” can take on several different meanings across different studies. Some studies look only at cost to infrastructure development aimed at reducing anticipated damage from future impacts of climate change to a given region, while other studies may look at the costs of climate-proofing infrastructure to the current climate.

³⁷ Constant 2008 U.S. \$ from McKinsey & Co. estimates using dollar-to-Euro exchange rate of \$1.25 to €1.00.

Figure 4. One Estimate of Annual Climate Change Financing Needed for Mitigation and Adaptation Activities in Lower-Income Countries, 2010-2020

In Constant 2008 US\$ Billions



Source: Project Catalyst, *Toward a Global Climate Agreement: Synthesis Briefing Paper*, June 2009.

Sources for International Climate Change Financial Assistance

As outlined in the previous section, trillions of dollars may be advocated over the coming decades to provide scaled-up, new, additional, predictable, and adequate³⁸ financing for lower-income countries to enable and support their actions on climate change. These investments would aim to upgrade and expand energy, industry, and transport infrastructure; to manage land use, land use changes, and forestry practices; and to support the implementation of adaptation activities for reducing climate vulnerability and building climate resilience. Having estimated the potential financial costs for climate change investment, the next step in the process would be to consider the sources from which these funds may be generated. While markets that are privately constituted and self-regulated have delivered moderately to climate change investments worldwide, public institutions—including national governments, international organizations, and official financing mechanisms of the UNFCCC³⁹—continue to be key drivers for climate change investments, specifically in lower-income countries. In the past, these institutions have relied heavily on government revenues to finance their activities. But, with climate-related costs rising into the tens or hundreds of billions of dollars a year, it is unlikely that direct budget contributions from governments can meet the demand. Other sources of finance may be sought, and many proposals exist.

³⁸ “Scaled-up,” “new,” “additional,” “predictable,” and “adequate” are all terms stipulated by the UNFCCC. Debate and controversy over the precise definitions of these terms is outlined in this section.

³⁹ See “Quasi-Private Sector Mechanisms UNFCCC Kyoto Protocol Mechanisms” section for description.

Potential sources of international climate change financing for lower-income countries can be divided into five broad categories: (1) private sector; (2) public interventions to stimulate private sector investment; (3) public sector; (4) innovative finance; and (5) voluntary actions. Most potential sources of finance would require some measure of government action or oversight—either directly, through budget contributions or a transfer of funds, or indirectly, through state-sponsored regulations or other incentives to leverage private sector investment. See **Appendix A** for an extended glossary of terms related to the various sources of climate finance discussed in this section.

Each of the categories identified above could potentially generate funds to address climate change in lower-income countries. Each has advantages and disadvantages. There is no single set of criteria for comparing these options.⁴⁰ Some of the criteria employed by commentators include the potential magnitude of funds that could be generated by each source; the economic and/or the GHG-related efficiency of each source; the practicality and predictability of generating funds from each source; the plausibility of assessing the “additionality”⁴¹ of each source; the overall accessibility and transparency of the funds provided and their use; and the equity and incidence effects as expressed among countries or between higher and lower-income countries. A brief summary of some of the more significant outstanding issues regarding the choice of sources is included in a discussion at the end of this section “Caveats Regarding Sources”; and a tabulated comparison of the various sources is offered in **Appendix B**.

Private Sector Sources

Private capital markets can provide one source for mobilizing financing for low-emission investments in lower-income countries. Instruments such as foreign direct investment, portfolio investment, microfinance, and public-private partnerships could be promoted to scale up private financing for climate change mitigation and adaptation activities. Incentive structures may need to shift in order to favor such investment, and economic and/or regulatory policies may need to be implemented to define targets and raise the profitability of alternatives. The section below outlines possible sources for international climate change financing in a privately constituted and self-regulated market. Public sector interventions to stimulate private capital investments are addressed in the next section.

Foreign Direct Investment: Foreign direct investment is the long-term participatory investment in the ownership of productive assets—such as factories, mines, and land—by a multinational corporation in a developing country’s energy, industry, or transport sector. It can be a relatively stable source of financing. It has the greatest advantages in mitigation activities, in terms of transferring technology and standards which could allow economic development to leapfrog into more climate-friendly sectors such as energy efficiency and renewable energy. Many high-

⁴⁰ Investigations into potential sources to finance international climate change mitigation and adaptation activities are numerous among economic foundations and environmental organizations. Further, in February 2010, United Nations Secretary General Ban Ki-moon assembled a High Level Advisory Group on Climate Change Financing to identify technically sound and politically feasible potential sources to scale up long-term financing for adaptation, mitigation, technology development and transfer, and capacity building in developing countries. Discussion on potential sources and an assessment on them according to several criteria—including revenue potential, efficiency, equity, incidence, practicality, reliability, additionality and acceptability—can be found at the Group’s U.N. website <http://www.un.org/wcm/content/site/climatechange/pages/financeadvisorygroup> (accessed March 31, 2011).

⁴¹ “Additionality” means additional to what currently exists or to would otherwise have occurred. Additionality of financing expresses the concern of current aid recipients that donors could merely shift existing development aid into climate-related funds, with no incremental assistance comparable to the extra costs they perceive to be incurring by addressing climate change.

emission sectors—such as road transport, metals, mining, chemicals, timber, and cement—are dominated by large multinational corporations, and their investments and practices may likely have a big influence on the timing of alternative development pathways in lower-income countries.⁴² However, given that foreign direct investment tends to lag rather than lead economic growth, it is unlikely to play a significant role in the early stages of a shift onto such a development pathway, particularly given the initial high degree of uncertainty and the absence of the in-country inputs that large international firms need in order to operate efficiently.⁴³

Portfolio Investment: Portfolio investment is the purchase of stocks, bonds, and money market instruments by foreigners for the purpose of realizing a financial return but not resulting in foreign management, ownership, or legal control. It could also be a stable source of international climate change financing. Investment could be mobilized through venture capital funds or specific “green” funds. It could appeal to investors willing to allocate investments to options that might generate less return but have greater potential in terms of climate change mitigation and socially responsible business practices. Currently, almost all “green” investment opportunities are concentrated in the more industrialized countries or the countries with emerging economies. Funds made available through this channel to lower-income countries have been both limited and skewed in favor of one or two countries. Without other incentives, the amount of resources that can be raised is likely to remain quite small.⁴⁴

Microfinance: Microfinance is the provision of financial services, in the form of small loans at market value, to lower-income country clients who traditionally lack access to banking and related services. It could serve as another vehicle for mobilizing local private resources for investments in climate-friendly development. Over the past three decades, microfinance has grown dramatically, with more than 7,000 microcredit institutions in 2006, serving about 80 million people in about 65 countries.⁴⁵ Climate-relevant microfinance has expanded beyond merely encompassing programs of credit provisioning to include schemes of microsavings and microinsurance. Given the close links between poverty reduction and climate vulnerability, scaling up microfinance has been considered a possible source of finance for climate adaptation programs. However, observers note that scaling up microfinance for long-term investment in productive activities and sustainable development would require support through a broader development strategy, including investments in infrastructure and human capital.⁴⁶

⁴² Department of Economic and Social Affairs, *World Economic and Social Survey 2009, Promoting Development, Saving the Planet*, United Nations Publication, 2009.

⁴³ For examples of surveys or reports on international investment in climate change, see The United Nations Conference on Trade and Development (UNCTAD), *World Investment Report 2010: Investing in a Low-Carbon Economy*, 2010; The World Bank Group’s International Finance Corporation’s Climate Unit, at <http://www.ifc.org/climatebusiness>; or any multinational private corporation’s climate change division (e.g., see, among others, General Electric Company, at http://www.ge.com/news/our_viewpoints/energy_and_climate.html; Ford Motor Company, at <http://corporate.ford.com/microsites/sustainability-report-2009-10/issues-climate>; or Wal-Mart Stores, Inc., at <http://walmartstores.com/Sustainability/> (accessed March 31, 2011).

⁴⁴ For a review of climate change issues as related to private investment, see the industry report from Mercer, *Climate Change Scenarios – Implications for Strategic Asset Allocation*, February 15, 2011, at <http://www.mercer.com/articles/1406410>; or any investor service site such as Responsible Investor, at <http://www.responsible-investor.com/home/>; or any investment private equity firm that concentrates on climate change investments (e.g., among others, Climate Change Capital, at <http://www.climatechangecapital.com/home.aspx>) (accessed March 31, 2011).

⁴⁵ DESA, op. cit.

⁴⁶ Anne Hammill et al., *Microfinance and Climate Change Adaptation*. Institute of Development Studies, Sussex, United Kingdom, Bulletin, vol. 39, no. 4 (September 2008). For examples of microfinancing corporations that address climate change, see, among others, Consultative Group to Assist the Poor, at <http://www.cgap.org/p/site/c/template.rc/1.9.34043/>; Green Microfinance, at <http://www.greenmicrofinance.org/>; The Center for Financial Inclusion, at

Public-Private Partnerships: Public-private partnerships are business ventures funded and operated through a partnership between government and one or more private companies. They involve a contract between a public-sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project. Public-private partnerships have helped stimulate private financing for energy efficiency and renewable energy projects in lower-income countries. Likewise, they have assumed a growing importance as a vehicle for financing climate change adaptation programs, in the form of infrastructure projects and the delivery of health services.⁴⁷

Public Interventions to Stimulate Private Sector Investment

Much of the economic policy debate on climate change has been dominated by the search for market-based solutions to the problem of market failure (i.e., the external costs of GHG pollution).⁴⁸ Successful policy would address the externalities of GHG pollution in the market and reveal the costs of choosing high-emissions over low emissions technologies. Once determined, these costs could be internalized through economic incentives (e.g., setting emissions levels or compliance pricing, etc.) to help drive pollution abatement. Funds for public or private sector contributions to international climate change financial assistance for lower-income countries could be derived and transferred in any number of ways from the finances generated by the market-mechanism.⁴⁹

<http://www.centerforfinancialinclusion.org/Page.aspx?pid=1273>; Opportunity International, at <http://www.opportunity.org/our-work/> (accessed March 31, 2011).

⁴⁷ For examples of public-private partnerships for climate change activities, the United Nations has a comprehensive database of voluntary multi-stakeholder initiatives contributing to the implementation of Agenda 21, Rio+5 and the Johannesburg Plan of Implementation (JPOI). It provides a searchable database of U.N. Commission on Sustainable Development (CSD) Partnerships information, publications, events, and links which implement sustainable development goals, at http://www.un.org/esa/dsd/dsd_aofw_par/par_index.shtml (accessed March 31, 2011).

⁴⁸ See box “GHG Emissions and Economic Externalities” for the economic assumptions underlying this analysis.

⁴⁹ Recent legislative examples of the use of market-based mechanisms to support international climate change financial assistance to lower-income countries include the June 2009, House passed H.R. 2454, the American Clean Energy and Security Act (ACESA or Waxman-Markey bill), which had provisions to allow domestic sources to meet their compliance requirements by acquiring up to 1 billion emissions offsets internationally each year, potentially providing a many-billion-dollars stream of private finance for emission abatement projects in developing countries. The bill also would have auctioned a share of domestic allowances to generate funds to help prevent tropical deforestation, build governance and private sector capacities, support cooperation to advance and deploy clean technologies, and to support adaptation to climate change in vulnerable and low-income countries. The parallel bill in the Senate, S. 1733, the Clean Energy Jobs and American Power Act (CEJAPA) or Kerry-Boxer bill, contained similar provisions. Some Members of Congress and advocates had also sought to increase allocation of allowances and/or appropriations for international finance, from \$2 billion to \$38 billion for international adaptation.

GHG Emissions and Economic Externalities

In economic theory, GHG emissions are considered a form of pollution and are thus characterized as “negative externalities.”

A negative externality (also referred to as a negative transaction spillover or an external cost) is defined as the cost of a transaction incurred by an individual who did not participate in the transaction; and, because this cost is incurred outside the transaction, it is not reflected in the market price. For example, buying fossil-fuel generated electricity may lead to air pollution and adverse health effects, the costs of which (both monetary and non-monetary, such as illness, suffering, or curtailed activities) are carried by many people, not necessarily just the electricity producers and consumers within the transaction. In most cases, the costs of these third-party illnesses, suffering, or curtailed activities have not been factored into the market price of the electricity.

For many economists, GHG emissions are an acute example of a negative externality for several reasons. First, GHG emissions are highly diffuse and dispersed—GHG pollution involves individuals and firms in every country and continent on the planet, and each polluter makes only a very small contribution to GHG pollution. This makes GHG emissions very difficult to control (contrast this with “point pollution” where pollution emerges from one fixed, well-defined, and easily identified and controllable source, like a factory polluting a river). Second, the environmental costs of GHG emissions are also highly dispersed, as they are borne by individuals and firms in every country and continent on the planet. Third, incurring these risks is completely disconnected from responsibility for emitting GHG, and there are no simple institutional (political, social, and economic) or technological ways of linking them.⁵⁰

Under the conditions of externalities, a free market (i.e., a privately constituted and self-regulated market) is “inefficient.” There is no incentive to limit pollution because the full cost of polluting the atmosphere with GHG emissions is not borne by the person or firm or country responsible for the pollution. For the market to be efficient, producers and consumers would need to internalize the external costs of pollution into the price of their transactions (i.e., determine a “price on carbon”). Theoretically, market efficiency would be achieved when the price of GHG emissions is set to equal the marginal benefits of abatement.⁵¹ Policymakers differ on the mechanisms through which to internalize the external cost of pollution, but many see some mixture of public sector regulation and/or market based incentives as the primary policy instruments.⁵²

In general, market-based mechanisms to reduce GHG emissions specify either the acceptable emissions level (quantity) or the compliance costs (price) and allow the marketplace to determine the economically efficient solution for the other variable. For example, tradable permit programs set the amount of emissions allowable under the program (i.e., the number of permits available limits, or “caps,” allowable emissions), while allowing the marketplace to determine what each permit will be worth. Likewise, carbon fees set the maximum unit cost (per ton of CO₂e) that one should pay for reducing emissions. Private decisions would determine how or how much pollution actually gets reduced. In one sense, preference for a carbon fee or a tradable permit system depends on how one views the uncertainty of costs involved and benefits to be received.⁵³

⁵⁰ “Climate Change and Development Challenges,” seminar series from the Centre for Financial and Management Studies, University of London, at http://www.cefms.ac.uk/cedepapp/124_web_unit/page_17.htm (accessed March 31, 2011).

⁵¹ Some economists view climate change as more than a simple policy problem of marginal abatement costs. See Morgan, M. Granger et al., “Why Conventional Tools for Policy Analysis Are Often Inadequate for Problems of Global Change,” *Climatic Change*, vol. 41, no. 3 (March 1, 1999): pp. 271-281, the discussion beginning p. 274.

⁵² For further discussion, see CRS Report RL33799, *Climate Change: Design Approaches for a Greenhouse Gas Reduction Program*, by Larry Parker; and CRS Report R41212, *EPA Regulation of Greenhouse Gases: Congressional Responses and Options*, by James E. McCarthy and Larry Parker.

⁵³ For further explanations of how emission control systems, including cap-and-trade, may work, see CRS Report RL33799, *Climate Change: Design Approaches for a Greenhouse Gas Reduction Program*, by Larry Parker; CRS Report RL34436, *The Role of Offsets in a Greenhouse Gas Emissions Cap-and-Trade Program: Potential Benefits and Concerns*, by Jonathan L. Ramseur; CRS Report R40242, *Carbon Tax and Greenhouse Gas Control: Options and Considerations for Congress*, by Jonathan L. Ramseur and Larry Parker, and CRS Report R41049, *Climate Change and the EU Emissions Trading Scheme (ETS): Looking to 2020*, by Larry Parker; among other relevant CRS reports on

Tradable Permit Systems: Tradable permit systems—better known as “cap and trade programs”—set an overall cap on GHG emissions and then issue tradable permits to firms which would allow them to emit specified quantities of GHG.⁵⁴ Firms are required to hold a number of permits equivalent to their level of pollution. Those firms that need to increase their permissible quantities would purchase permits on the market. Those that could reduce their emissions more cheaply could potentially sell their allowances on the market. Some cap and trade programs would auction all permits during the initial issuance. Some programs would phase in permits through a period of free or reduced price allocations of permits. Some programs include a mechanism whereby firms could gain emission credits through pollution reductions performed in economic sectors outside of the regulated market (e.g., agriculture, forestry, or in countries or regions not covered by the program). This is referred to as an “offset” market. In each case, revenue for international climate change assistance can be generated in a number of ways.

1. **Revenues from domestic auctioning of emission allowances in domestic emission trading schemes:** This would involve auctioning of domestic credits (as in the EU Emission Trading Scheme phase III, or any potential domestic cap and trade program) and transferring some part of associated revenues to international climate change financing.
2. **Revenues from international auctioning of emission allowances in international emission trading schemes** (such as Assigned Amount Units under the Kyoto Protocol): An Assigned Amount Unit (AAU) is a tradable “carbon credit” representing an allowance to emit GHG under the UNFCCC Kyoto Protocol emissions trading market. AAUs are issued up to the level of initial “assigned amount” of an Annex 1 Party. Some countries support sourcing revenue for international climate change activities by retaining some allowances from the Annex I countries and then auctioning them.⁵⁵
3. **Revenues from offset levies:** This would involve withholding a share of offset revenues from emissions trading markets—such as the Kyoto market or any domestic market—as an international source of climate change financing. This is currently done with the Kyoto Protocol’s Clean Development Mechanism (CDM),⁵⁶ which capitalizes the UNFCCC Adaptation Fund through a 2% levy on the proceeds from its certified emission reductions.⁵⁷

“Climate Change Policy” available at <http://www.crs.gov/>.

⁵⁴ Tradable Permit Systems are currently in place in the United States at the state and regional level. See the Regional Greenhouse Gas Initiative (RGGI) wherein ten Northeastern and Mid-Atlantic states have capped CO₂ emissions from the power sector with the aim of reducing emissions by 10% by 2018 at <http://www.rggi.org/home>. See also the regional strategy proposed by the Western Climate Initiative at <http://www.westernclimateinitiative.org/>

⁵⁵ The United States is not a Party to the Kyoto Protocol, and has often not supported international efforts to create an international emission trading market, particularly one in which all significant GHG emitting countries (e.g., China, India) are not a Party.

⁵⁶ See discussion of the Clean Development Mechanism in the section “Methods for Delivering International Climate Change Financial Assistance.”

⁵⁷ For more information about the Clean Development Mechanism or the Adaptation Fund, see the UNFCCC website at http://unfccc.int/cooperation_and_support/financial_mechanism/adaptation_fund/items/3659.php

Emission-Based Fees, and Other Levies: An emission-based fee is an environmental fee that is levied on the GHG content of fuels or other sources of emissions. By increasing the cost of emissions, emission fees raise public revenue, any or all of which could be transferred and used for international climate change assistance to lower-income countries. Emission fees are occasionally referred to as “carbon taxes”; under guidelines of the U.S. Office of Management and Budget, a “tax” is primarily for generating revenues, while a user (i.e., emissions) fee⁵⁸ is primarily to charge for an entity’s use of a resource (e.g., the atmosphere as a place to discharge waste emissions).⁵⁹

- a. **Revenues from GHG fees:** This would involve a tax on GHG emissions in countries raised on a per ton emitted basis.
- b. **Revenues generated from taxes on international aviation and shipping:** This would involve either a levy on maritime bunker/aviation jet fuels for international voyages, or a levy on passenger tickets of international flights.
- c. **Revenues generated by removing fossil energy subsidies:** This would involve public funds made available by the removal of fossil energy subsidies which could be diverted towards international climate change financing. While not a levy per se, redirection of subsidy grants or increases in tax receipts by reducing credits and deductions would function in a comparable economic manner to an emission tax on consumers.
- d. **Revenues from fossil fuel extraction royalties/licenses:** This would involve a redirection of a portion of existing government receipts associated with domestic fossil fuel production for use in international climate change financing.⁶⁰

Public Sector Sources

Allocating resources in a national public budget directly to international climate change assistance is a straightforward way for governments to finance activities in lower-income countries, and historically public funding has played an important role in both mitigation and adaptation financing. In practice, public funds may be mobilized similar to, or as part of, official development assistance (ODA); or, public funds may flow through international financial institutions as grants or grant-equivalent (i.e., “concessional”) loans.⁶¹ While some see public funds as a practical, equitable, and potentially predictable source of international climate change financing, political acceptability in the donor countries over the longer term may depend on national circumstances and on the size of the contribution. Further, global fiscal cycles can place public finances in many high-income countries under extreme pressures and could make it

⁵⁸ U.S. Office of Management and Budget, *User Charges*, Circular No. A-25 Revised, at http://www.whitehouse.gov/omb/circulars_a025/ (accessed March 31, 2011).

⁵⁹ It should be noted that fees set a price on emissions, not a limit on the quantity; and their primary effect is economic, not environmental. Thus fees may be unrelated to marginal benefits or pollution abatement.

⁶⁰ Among higher-income countries, fossil fuel revenues are concentrated among five major producers (U.S., U.K. Canada, Australia, Norway). Impacts within countries would be determined by how budgets are adjusted to compensate for this diversion of existing revenues.

⁶¹ “Concessional loans” are loans that are extended on terms substantially more generous than market loans. The concessionality is achieved either through interest rates below those available on the market or by long grace periods, or a combination of these. See International Monetary Fund, *External Debt Statistics: Guide for Compilers and Users – Appendix III, Glossary*, 2003.

difficult to generate sufficient and reliable financial flows over the required period or in the required order of magnitude.⁶²

Voluntary Budget Contributions: Voluntary contributions involve public revenues provided to recipient countries—either directly or by international financial institutions—through national budgetary decisions. Voluntary contributions have played—and likely may continue to play—the most important role in publically funded international climate change finance. Voluntary contributions may draw revenue from a domestic base (e.g., through taxes or fees) and allow for contributing governments to (1) pursue different options at different times as public opinion evolves, (2) divert only a portion of revenue from a particular source for international climate change financing, rather than the entire revenue flow, and (3) retain control over annual spending, rather than provide some kind of automated mechanism. But voluntary contributions in many countries are subject to legislative decision making and annual appropriations, making predictability and reliability difficult to ascertain.

Mandatory or Assessed Budget Contributions: Some lower-income countries⁶³ have proposed that UNFCCC Annex I parties contribute from 0.5%-1.0% of their gross national income to climate change financing in non-Annex I countries, to be channeled through a multilateral fund under the authority of the Convention. This would generate approximately \$150 billion to \$300 billion per year at pre-crisis income levels of major Organization for Economic Cooperation and Development (OECD) economies. Others have proposed assessed contributions formulated on the basis of some combination of a contributing country's GHG emissions, population, and gross domestic product, in accordance with the principle of common but differentiated responsibilities and respective capabilities. Supporters propose that mechanisms should be put in place to make contributions legally binding. The source for these funds would be similar to voluntary contributions (i.e., domestic taxes or fees).

Public Debt Instruments: Public debt instruments raise money for public entities by borrowing from bond markets. Most high-income country governments can borrow money at a discount because their chance of default is considered low compared to privately held companies. Multilateral Development Banks (MDB) and other International Financial Institutions (IFI) use the same principle for raising capital for lower-income country governments. Using their good credit rating, which is based on the fact that they are backed by the capital subscriptions of developed country governments, IFIs and MDBs borrow money at favorable conditions to lend at a lower interest rate or accept a higher risk, a benefit that they can pass on to their clients in the interest of development and climate protection. Increased capital subscriptions from higher-income countries would allow these institutions to increase lending to lower-income countries.

Innovative Finance

Despite the spectrum of sources available for international climate change financing, many observers consider current funding inadequate, and look to more innovative methods of finance. Various proposals have been made for raising revenues for climate action from sources not closely linked to GHG emissions. While these proposals have the capacity to generate large

⁶² These arguments are further outlined in United Nations, *Report of the Secretary-General's High Level Advisory Group on Climate Change Financing*, November 5, 2010, at http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/AGF_reports/AGF%20Report.pdf (accessed March 31, 2011); and responses to it, such as Timme van Melle et al., *International Climate Financing: From Cancún to a 2°C stabilization pathway*, Ecofys Netherlands BV, 2011, at http://www.fao.org/fileadmin/user_upload/rome2007/docs/Climate_financing_after_Cancun%20ECOFYS.pdf (accessed March 31, 2011).

⁶³ Proposed to the UNFCCC by the Group of 77 and China. The Group of 77, see <http://www.g77.org/doc/>.

quantities of financial assistance, they may be perceived as arbitrary in their choices and by the numerous competing causes that could benefit from their financing. Two of the more heavily discussed proposals include a financial transaction tax and special drawing rights.

Financial Transaction Tax: A Financial Transaction Tax (FTT) is a levy on international financial transactions. The level of estimated revenues from the FTT is driven by the tax base, the tax rate, and the elasticity of the transaction volume to the tax rate. A global FTT, as currently debated, would be a new and additional source for climate finance. Strong international coordination and allowances for international implementation could increase the efficiency of such a source. However, critics point out that FTTs are unconnected to GHG emissions in any practical way, and the unresolved issues of incidence on both higher and lower-income countries would make it difficult to implement universally.

Special Drawing Rights: Special Drawing Rights (SDRs) are an accounting mechanism—sometimes called “virtual currency”—typically held as a reserve asset in financial organizations such as the International Monetary Fund (IMF). SDRs supplement IMF member countries' official reserves and generate liquidity in the event of balance of payments difficulties. The value of an SDR is based on a basket of key international currencies. In some proposals to capitalize a fund for climate change financing, SDRs could be issued in exchange for real currency to generate revenues. In other proposals, bonds could be issued on the back of paid-in SDRs to generate liquidity and contributors would receive an equity stake in the fund proportional to their contribution. In either case, the IMF would not necessarily be the entity issuing these proposed SDRs or managing the system. Most policymakers have not supported the use of SDRs to capitalize resources for climate change finance because the effort would undermine the primary purpose of the SDR system, present legal and political/financial challenges in implementation, and offer few if any advantages over traditional capitalization.

Voluntary Actions

Some sources for international climate change financing may be found in philanthropic or voluntary markets. Proponents note that some companies and some consumers have already begun to implement voluntary changes and have already begun to make voluntary contributions in order to reduce GHG emissions. Many believe that absent more aggressive governmental intervention, it is unlikely that these trends would be quantitatively sufficient and timely enough to make a significant impact on climate change. Voluntary action may also hurt relative competitiveness and increase costs in the short term, reducing incentives to adopt more stringent standards in the future.

Philanthropy: Many philanthropic organizations already provide contributions to climate change mitigation or adaptation financing in lower-income countries. Many work closely with nongovernmental and civil society organizations to promote education, knowledge sharing, and human capital advancements to further climate change investment in lower-income countries.

Voluntary Offsets: Voluntary offsets are “carbon neutral” certificates that are sold by some private entities in exchange for climate-related services (e.g., a contribution to an international climate change fund). Companies currently sell offsets in exchange for assurance that the funds will be used to reduce GHG emissions (e.g., by planting trees). This may differ from general philanthropy in the sense that funds are, in principle, directly in exchange for quantified emissions reduction performance and could be issued through aggregators of small, diversified projects or through brokers.

Caveats Regarding Sources

The Role of Markets: The economic debate within international climate change policy has been dominated by assessments of market-based mechanisms aimed at changing price incentives so that investment in low-emissions development becomes more attractive (e.g., cap and trade, carbon fees, loan guarantees). Many agree that private investment will likely have a predominant role to play in any low-emissions economic future, and that establishing a price on GHG emissions will likely have a part in any effective policy agenda. However, concerns remain whether such mechanisms can induce the required shifts in production and consumption patterns and mobilize the necessary investment. Some assert that price mechanisms are unreliable guides in cases where investments are large, where returns are not immediately visible, and where conditions are dependent upon unpredictable policy initiatives. The uncertainties in investments are heightened when the climate and development challenge takes place against a backdrop of systemic financial market failure and natural resource price volatility. As such, some policymakers believe that market mechanisms would contribute only a partial role in a larger package of measures that includes a reliance on regulations and large-scale public investments.⁶⁴

The Role of Governments: Notwithstanding economic considerations, the “private funding” versus “public funding” debate also has political, legal, and equity components. For example, some recipient countries contend that donor governments should provide public funds as the main source of climate change assistance because they understand climate finance as an international equity issue, with contributions serving as reparation for past environmental loss or damage. Others assert that developed country governments—not private corporations—have signed onto legally binding international environmental agreements to provide assistance to lower-income countries. Some may believe public monies would be more direct and easier to generate, and therefore more predictable and sustained. They may not consider or recognize the challenges in some countries to appropriating federal funds for international purposes. Similarly, some recipient countries may be suspicious of foreign private investment and would prefer the funding to be under the control of local governmental decision-makers, hoping this would better reflect local priorities and indigenous cultures. Conversely, donor countries tend to underscore the costs of extending such financing, including the direct outlays of funds, the secondary costs to their domestic economies for investing abroad at concessional terms, and the losses accrued by passing funds through governments institutions or other intermediaries.

The Requirement for Scaled Up, New and Additional, Predictable and Adequate Financing: Most, if not all, low-income countries have stated that fulfilling their commitments under the UNFCCC would depend on financial and technical support from higher-income countries. As noted above, they seek resources that can be defined as “scaled up, new and additional, predictable and adequate.”⁶⁵ While the term “scaled up” presumes an increase in funding from existing sources, the terms “new,” “additional,” and “adequate” are subject to diverse interpretations and controversy. “New” funds could signify entirely unique funding sources arising from new public levies, new international allocations, or new multilateral mechanisms; or, it could simply refer to funds from a new fiscal year, a new multilateral replenishment contribution, or a new domestic or international program that takes the place of an expiring one. Some are concerned that funding is not shifted merely from one type of development assistance

⁶⁴ See DESA and UN, *Report of the Secretary-General’s High Level Advisory Group on Climate Change*, op. cit.

⁶⁵ As outlined in the most recent UNFCCC draft negotiations: United Nations Convention on Climate Change, *Draft decision -/CP.16, Outcome of the work of the Ad Hoc Working Group on long-term Cooperative Action under the Convention*, 2010, Section IV.A. “Finance,” at http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_lca.pdf (accessed March 31, 2011).

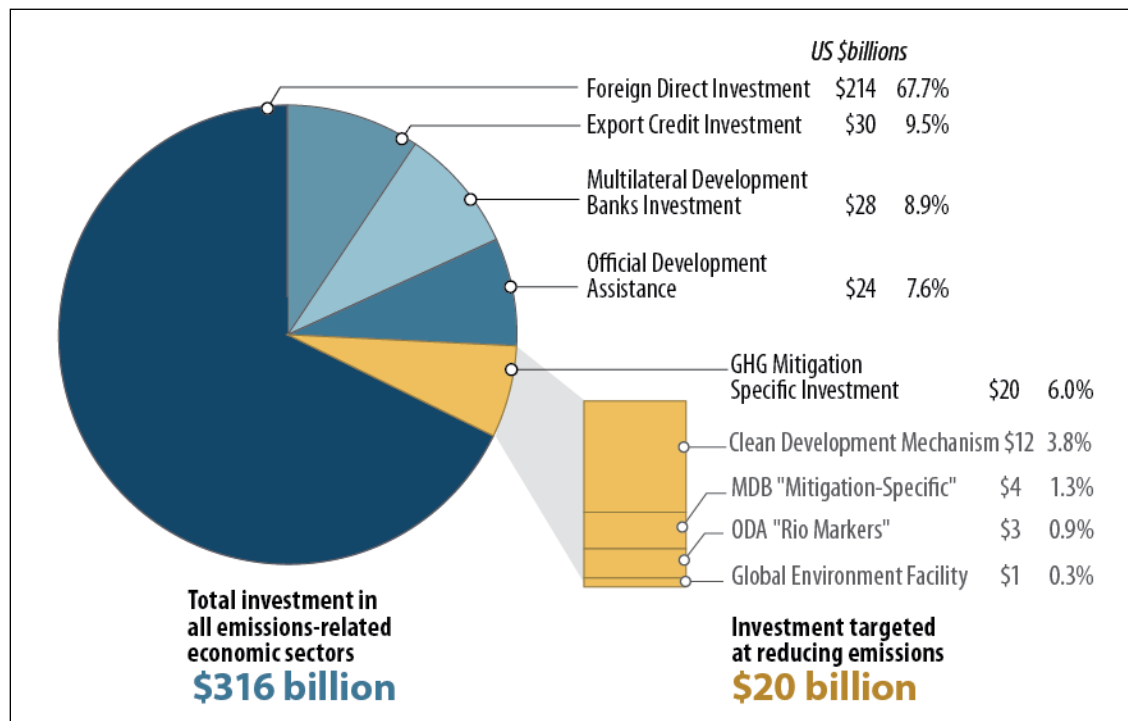
to climate change assistance, with little or no increase comparable to the stated needs. “Additional” is meant to denote an increment above and beyond “business-as-usual.” However, speculating as to counterfactual development assistance trajectories that would have taken place if not for the “additional” funding is rife with debate. Finally, the term “adequate,” with respect to needs, is a wholly subjective quantity.

Methods for Delivering International Climate Change Financial Assistance

The previous section outlined many of the existing and proposed funding *sources* for investment in climate change mitigation and adaptation activities in lower-income countries. The next step would be to consider the methods through which these funds could be transferred from contributing countries to their recipients. A variety of mechanisms, organizations, and institutions for disbursing international climate change financing already exists. All have a role in catalyzing climate action: mobilizing additional resources; reorienting public and private flows toward low-carbon and climate-resilient investments; supporting the research, development, and deployment of climate-friendly technologies; and strengthening the institutional capacities of recipient countries. Mechanisms can be divided into three broad categories: (1) private or quasi-private sector, (2) public sector bilateral, and (3) public sector multilateral.⁶⁶ Foreign Direct Investment (FDI), Export Credit markets, non-concessional lending at the Multilateral Development Banks (MDB), and the various Kyoto Protocol market mechanisms at the UNFCCC (e.g., the Clean Development Mechanism (CDM)) would be classified as private or quasi-private sector mechanisms. Public sectors mechanisms would include contributing countries’ Official Development Assistance (ODA) as well as many of the multilateral environment and development trust funds (e.g., the Global Environment Facility (GEF)) and the concessional lending windows housed at the various institutions at the World Bank Group.

Figure 5 presents a comparison of the financial flows for energy and infrastructure development—including development specific to climate change mitigation—in low-income countries per annum (in this example, the analysis compares flows for the year 2007). The figure shows that total investment in all “mitigation-relevant” sectors (i.e., funding for economic development in all key sectors that shape future GHG emissions in developing countries, including energy, transport and water infrastructure, industry, waste management, agricultural, and forestry) amounted to an estimated \$316 billion, of which over 80% was from private sector funds. It should be noted that “mitigation-relevant” investments need not be GHG reducing investments (e.g., both wind power generation and fossil fuel power generation are “mitigation-relevant” investments). “Mitigation-specific” investments (i.e., investments in which the primary objective is to reduce GHG emissions) amounted to \$20 billion in 2007—or 6% of total key sector investment—of which approximately 60% was from private sector funds.

⁶⁶ In general, “bilateral” assistance involves a direct transfer from one country to another; “multilateral” assistance is distributed through international organizations and agencies like the United Nations Organization and the World Bank Group. Further clarifications and debates on the mechanisms respective merits are elaborated in this section.

Figure 5. Total Investment in Emissions-Related Economic Sectors in 2007

Source: Jan Corfee-Morlot et al., *Financing Climate Change Mitigation: Towards a Framework for Measurement, Reporting, and Verification*, Organization for Economic Cooperation and Development, October 2009.

Notes: "Total Investment in all emission-related economic sectors" refers to assistance for economic development in all key sectors that shape future emissions in developing countries, including energy, transport and water infrastructure, industry, waste management, agricultural, and forestry. "Emission-related" investment may serve to increase or decrease GHG emissions. "GHG mitigation-specific" assistance refers to assistance aimed "to achieve GHG mitigation in developing countries as its main objective." "ODA "Rio Markers" refers to Official Development Assistance contributed by OECD Members of the Development Assistance Committee (DAC), who report their aid activities to the OECD Creditor Reporting System (CRS) database, that specifically targets the objectives of the three United Nations Rio conventions (i.e., U.N. Convention on Biological Diversity, U.N. Framework Convention on Climate Change and U.N. Convention to Combat Desertification).

All of the mechanisms identified above could potentially deliver funds to address climate change in lower-income countries. Each has advantages and disadvantages, and there is no single set of criteria for comparing these options. Many critics contend that the overall architecture of financial mechanisms to address climate change is underfunded and unnecessarily complex. The array of funds and financial institutions lack both strategic mandate and adequate coordination, leaving many gaps, overlaps, and inefficiencies. Divisions have arisen over the proper financial instruments to employ in lower-income countries (e.g., grants or loans) as well as the role shared by the public and private spheres. A brief summary of some of the more significant outstanding issues regarding the choice of sources is included in a discussion at the end of this section under "Caveats Regarding Mechanisms."

Private Sector Mechanisms

The sheer magnitude of the required investment for climate change mitigation and adaptation activities necessitates capital flows from the private sector. Currently, the private sector accounts for over 85% of global investment in those economic sectors relevant to climate change mitigation and adaptation activities, although governments largely control the underlying

infrastructure investments that affect the opportunities for low-emissions economic development. Similarly, public sector financing has been more prominent in low-income countries—particularly the least developed countries and the small island states—in which private entities are still reticent to invest. To this point, private capital markets have filled in the gaps in climate change financing in lower-income countries, and, in some cases, have taken the lead in market-ready mitigation investment to create a low-carbon economy, such as energy-efficient machinery, cleaner cars, and renewable energy.

Foreign Direct Investment: Over the past two decades, the international climate change agenda has shared a stage with an expanding global economy.⁶⁷ As such, particular attention has been paid to foreign direct investment (FDI) in lower-income countries to address climate change. FDI has many potential benefits, including financing infrastructure expansion without contributing to public debt, supporting technology and knowledge transfer, and acting as a catalyst for further capital inflows. Despite considerable efforts to attract FDI in the last several years, actual levels of such investment into the energy and industry sectors in many countries with economies in transition have been moderate.⁶⁸ Similarly, FDI tends to lag rather than lead economic growth, and, as such, is not likely to play a significant role in the early stages of a shift to lower-emission development trajectories. Mobilization of the necessary capital resources requires an attractive investment climate—a business-friendly environment, favorable macroeconomic performance, and a regulatory environment that is predictable, fair, transparent and efficient.

Quasi-Private Sector Mechanisms

Several mechanisms function predominantly in the private sector but were set up initially by public sector entities or are currently backed by guarantees (whether financial or institutional) from them.

Export Credit Agencies: Export Credit Agencies (ECA) are private or quasi-governmental financial institutions or agencies that provide financing to domestic companies for their international trade activities. ECA services can include such instruments as direct loans, loan guarantees, and insurance for companies in order to help promote exports. These programs are implemented in cases where the private sector is unable or unwilling to provide financing to ensure equitable competition for U.S. exporters due to potential commercial, exchange rate, or political risks and uncertainties in overseas markets. The primary objective of ECAs is to remove the risk of repayment to exporters by shifting the financial burden of uncertainty onto themselves, for a premium. The U.S. Export-Import Bank and the Overseas Private Investment Corporation are two examples of export credit and overseas investment agencies connected to the United States government.⁶⁹

Development Banks: Non-Concessional Lending: The International Bank for Reconstruction and Development (IBRD) and the International Finance Corporation (IFC) are the facilities within the World Bank Group that make non-concessional or “hard” loans to middle-income countries as well as provide services for private sector ventures and projects in developing countries. While similar in structure to a commercial lending facility, the IBRD focuses primarily on investments that support poverty reduction, economic development, and global public goods, including food security and climate change. The IBRD currently has plans to increase lending to

⁶⁷ Strong arguments exist on both sides as to whether “globalization” is a benefit to developing countries, the environment, or both.

⁶⁸ World Bank, 2010, op. cit.

⁶⁹ See CRS Report 98-568, *Export-Import Bank: Background and Legislative Issues*, by Shayerah Ilias.

support renewable energy and energy efficiency projects in lower-income countries, and it continues to serve as a center for research and knowledge-sharing on development practices, promoting lessons learned and identifying innovations to combat the effects of climate change. The regional banks in the World Bank Group have similar non-concessional lending windows. The United States supports the IRBD through its capital subscription to the IBRD General Capital Increase (GCI).⁷⁰

UNFCCC Kyoto Protocol Mechanisms: The UNFCCC introduced three market-based mechanisms to assist countries with commitments under the Kyoto Protocol to limit or reduce greenhouse gas emissions. The mechanisms include International Emission Trading, the Clean Development Mechanism, and Joint Implementation. Most relevant to developing country assistance, the Clean Development Mechanism (CDM) allows entities with emission-reduction or emission-limitation commitments under the Kyoto Protocol to implement emission-reduction projects in lower-income countries in order to earn saleable certified emission reduction (CER) credits which can be counted towards meeting Kyoto targets. Though the CDM has been used far less than many had initially envisioned (in part because of slow processes and governance issues), its board says that it has issued more than 1.7 billion tons of CO₂e GHG reductions (\$2.9 billion expected by end of 2012), and has leveraged US\$33 billion from investors in 2007 alone.⁷¹ Similar programs include the World Bank's Carbon Finance Unit, which uses donations from private and public entities to purchase GHG emission reductions in client countries.⁷²

Public Sector Mechanisms

As a complement to private sector investment, many countries also contribute funds to climate change initiatives in lower-income countries through various public sector mechanisms, organizations, and institutions. Governments may choose to contribute these funds either directly to recipient countries (i.e., bilateral assistance) or in combination with other donors through an international institution (i.e., multilateral assistance).⁷³ Bilateral assistance is often provided through a contributing country's development agency (e.g., U.S. Agency for International Development (USAID)). These direct and long-standing relationships between donor and recipient countries' development agencies can enable cooperative implementation plans with respect to environmental issues. Many climate change initiatives share a sensitivity to other development sectors (e.g., agriculture, biodiversity, health, and infrastructure) and provide an opportunity to implement innovative cross-sectoral programs. Further, bilateral assistance gives contributors more control over where the money goes and how the money is spent. For example, contributing countries may have more flexibility to allocate funds to countries that are of geopolitical strategic importance, but not facing the greatest development needs, than might be possible by providing assistance through a multilateral organization. By building a clear link between the contributing country and the recipient country, bilateral assistance may also garner more goodwill from the recipient country than if the funds had been provided through a multilateral organization.

⁷⁰ See CRS Report R41170, *Multilateral Development Banks: Overview and Issues for Congress*, by Rebecca M. Nelson.

⁷¹ Danieli Violetti, "Clean Development Mechanism: Achievements and Developments," paper presented at the 6th Session of the High-Level Task Force on the Implementation of the Right to Development, Geneva, 2010.

⁷² See CRS Report RL33826, *Climate Change: The Kyoto Protocol, Bali "Action Plan," and International Actions*, by Jane A. Leggett.

⁷³ For more on the choice between bilateral and multilateral aid, see, for example: Helen Milner and Dustin Tingley, "The Choice for Multilateralism: Foreign Aid and American Foreign Policy," Working Paper, February 10, 2010, and

Multilateral organizations offer different benefits for contributing countries. Multilateral organizations pool the resources of several contributors, allowing countries to share the cost of development projects (often called burden-sharing). In this way, one country's multilateral assistance is said to "leverage" additional funds from other contributing countries, as well as from implementing agencies, non-governmental organizations, the private sector, and even the recipient countries themselves. Further, long-standing and established multilateral institutions dedicated to climate change initiatives and sustainable development practices may hold a level of expertise and may benefit from knowledge carry-overs that are not as prevalent in the smaller bilateral assistance agencies of some contributing countries. Additionally, contributing countries may find it politically sensitive to attach or enforce policy reforms to bilateral assistance, and multilateral organizations can usefully serve as a shield for imposing and enforcing conditionality that may be politically sensitive to attach bilaterally. Finally, many believe that providing funds to multilateral organizations plays a role in a contributing country's leadership in the world economy.

Table 2 lists some of the most prominent bilateral and multilateral financing mechanisms for climate change activities in lower-income countries. Below are descriptions of the various public sector mechanisms currently employed by the United States. Commentary on the effectiveness of each mechanism can be found in the topical discussion at the conclusion of this section as well as in the respective CRS reports footnoted under each heading.

Table 2. Examples of Bilateral and Multilateral Financing Mechanisms for Climate Change Mitigation and Adaptation Activities in Lower-Income Countries

In Constant 2008 US\$ Millions

Name	Funding Pledge (All Donors)	Use ^a	Details
Multilateral Funds Associated with the United Nations Framework Convention on Climate Change			
Global Environment Facility (GEF)-5	4,340	M	Provides grants. Time frame: 2010-2014, prior contributions from 1991 through 2009 amount to approximately \$9 billion
Adaptation Fund	400-1,500	A	Provides grants. Time frame: 2008-2012; as of 2008, \$91.3 million was available (4 million certified emission reductions (CERs) at €17.5 per CER)
Least Developed Countries' Fund	172	A	Provides grants. Includes pledges as of December 2008; \$91.8 million has been received as of November 2008; operated by GEF
Sustainable Forest Management	154	M	Provides grants. Special program under GEF-4 for land use, land-use change and forestry
Special Climate Change Fund (SCCF Adaptation)	90	A	Provides grants. Include pledges as of December 2008; \$68 million has been allocated to 15 projects as of November 2008; operated by GEF

Helen Milner, "Why Multilateralism? Foreign Aid and Domestic Principal-Agent Problems," in *Delegation and Agency in International Organizations*, eds. Darren Hawkins et al. (New York: Cambridge UP, 2006), pp. 107-139.

Name	Funding Pledge (All Donors)	Use ^a	Details
Strategic Priority on Adaptation (SPA)	50	A	Pilot program on adaptation of the GEF Trust Fund
Green Climate Fund	—	A,M	Currently being negotiated under the UNFCCC Conference of Parties Ad Hoc Working Group on Long-Term Cooperative Action
Other Multilateral Funds			
Clean Technology Fund (World Bank Climate Investment Funds)	4,334	M	Time frame: 2009-2012; administered by the World Bank. Provides grants and loans; funded by the United States, the United Kingdom, Japan, among others
Strategic Climate Fund (World Bank Climate Investment Funds)	2,006	A,M	Time frame: 2009-2012; administered by the World Bank. Provides grants and loans; funded by the United States, the United Kingdom, Japan, among others
Forest Carbon Partnership Facility (World Bank)	300	M	Provides grants and loans; time frame 2008-2020
Global Facility for Disaster Reduction and Recovery (GFDRR)	84	A	Provides grants; time frame 2007-2010; targets high-risk low- and middle-income countries to mainstream disaster reduction in development strategies
United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD)	35	M	Provides grants; administered by the UNDP; Norway, through its Climate and Forest Initiative, is the first donor, with US\$12 million
Sustainable Energy and Climate Change Initiative (SECCI)	29	A,M	Provides grants and loans; the fund backs major investments in the development of biofuels, renewable energy, energy efficiency, and a wide range of sustainable energy options
Bilateral Assistance			
Cool Earth Partnership (Japan)	10,000	A,M	Provides grants and loans; time frame: 2008-2012; up to US\$2 billion to improve access to clean energy, and US\$8 billion for preferential interest rate loans for mitigation projects
Climate and Forest Initiative (CFI) (Norway)	2,250	M	Provides grants; time frame: 2008-2012; pledged US\$102 million to the Amazon Fund; other pledges to Brazil, Indonesia
International Window of the Environmental Transformation Fund (ETIW) (United Kingdom)	1,182	A,M	Provides grants and loans; time frame: 2008-2010; most of the funds will be allocated through the World Bank Climate Investment Funds

Name	Funding Pledge (All Donors)	Use ^a	Details
International Climate Initiative (ICI) (Germany)	764	A,M	Provides grants; funding for the initiative will be generated from auctioning 10 per cent of its allowances from the Emission Trading Scheme of the European Union (EU ETS); it has earmarked up to €120 million for the next five years
International Forest Carbon Initiative (IFCI) (Australia)	129	M	Provides grants; time frame 2007-2011; as of November 2008, US\$50 million was allocated
United Nations Development Program-Spain MDG Achievement Fund - Environment and Climate Change thematic window	90	A,M	Provides grants; time frame: 2007-2010; Spain has pledged €528 to the Fund and US\$90 million has been allocated for the Environment and Climate Change thematic window
Global Climate Change Alliance (GCCA) (European Commission)	76	A,M	Provides grants; time frame: 2007-2011; targets most vulnerable countries (least developed countries and small islands)

Source: Department of Economic and Social Affairs, *World Economic and Social Survey 2009, Promoting Development, Saving the Planet*, United Nations Publication, United Nations Publication, 2009, and World Bank, *World Development Report: 2010: Development and Climate Change*, and the websites of each listed fund.

a. Abbreviations: A, Adaptation; M, Mitigation; figures adjusted to 2008 US\$.

Bilateral: Official Development Assistance⁷⁴

Official Development Assistance: Official Development Assistance (ODA) programs, funded primarily through the U.S. Agency for International Development (USAID), aim to advance and sustain U.S. engagement with specific developing countries on critical global issues such as food security and climate change. ODA-funded programs are designed to support the efforts of recipient governments and their private sector and non-governmental partners to implement the political and economic changes needed for sustainable practice. USAID has targeted “adaptation,” “clean energy,” and “sustainable landscape” programs as the three pillars of the Obama Administration’s Global Climate Change Initiative to assist vulnerable countries adapt to the impacts of climate change and reduce net GHG emissions in their economies. USAID estimates that approximately one-sixth of its agency-wide Development Assistance account is earmarked for the Administration’s Global Climate Change Initiative programs.

U.S. appropriations for bilateral climate change initiatives through USAID’s or the Department of the State’s ODA programs is subject to congressional approval. Congressional committees of jurisdiction include the U.S. House of Representatives Committee on Foreign Affairs, (various subcommittees); the U.S. House of Representatives Committee on Appropriations, Subcommittee on State, Foreign Operations, and Related Programs; the U.S. Senate Committee on Foreign Relations, Subcommittee on International Development and Foreign Assistance, Economic Affairs, and International Environmental Protection; and the U.S. Senate Committee on Appropriations, Subcommittee on State, Foreign Operations, and Related Programs.

⁷⁴ For a broader and more detailed discussion of ODA, please see CRS Report R40213, *Foreign Aid: An Introduction to U.S. Programs and Policy*, by Curt Tarnoff and Marian Leonardo Lawson.

ODA is a significant component of international climate change assistance. The Organization for Economic Cooperation and Development (OECD) has estimated bilateral, climate-specific support to low-income countries at an annual average of about \$3.4 billion from 2003-2007, as reported in their Creditor Reporting System. This climate-specific financing represented about 0.01% of contributing countries' Gross Net Income (GNI) for that period, and about 3.4% of contributing countries' total bilateral ODA for all purposes. Accordingly, the United States' contributions represented about 0.002% of GNI and about 0.1% of all bilateral ODA, in both instances below the international average. Given the vagaries of definitions and reporting, the OECD estimates that all bilateral financing support for climate mitigation represented about US\$8 billion to \$53 billion in 2007—no more than one-sixth of the total estimated flows of about US\$314 billion going to the sectors relevant to climate mitigation actions (i.e., energy, transportation, agriculture, water supply, industry, minerals, and mining).⁷⁵

Multilateral: International Financial Institutions

International Financial Institutions: International Financial Institutions (IFI) are the primary multilateral mechanisms for climate change financing to lower-income countries. IFIs coordinate multiple donor country contributions and provide loans, grants, and investment services to developing economies to promote growth, alleviate poverty, and aid in targeted programs such as climate change and food security. IFIs were designed to provide professional advice and technical support to address the economic impediments to developing country investment. In the United States, climate-related funding for IFIs is managed primarily through the Office of International Affairs at the U.S. Department of the Treasury.

U.S. appropriations for multilateral climate change initiatives through authorized International Financial Institutions are subject to congressional approval. Congressional committees of jurisdiction include the U.S. House of Representatives Committee on Financial Services, Subcommittee on International Monetary Policy and Trade; the U.S. House of Representatives Committee on Appropriations, Subcommittee on State, Foreign Operations, and Related Programs; the U.S. Senate Committee on Foreign Relations, Subcommittee on International Development and Foreign Assistance, Economic Affairs, and International Environmental Protection; and the U.S. Senate Committee on Appropriations, Subcommittee on State, Foreign Operations, and Related Programs.

- a. **Development Banks: Concessional Lending:** The International Development Association (IDA) is a facility within the World Bank Group that makes grants and highly concessional or “soft” loans to the world’s 79 poorest countries. IDA remains the single largest source of development finance globally across a range of sectors, including climate change mitigation and adaption initiatives as well as climate-relevant programs in primary education, basic health services, clean water and sanitation, environmental safeguards, business improvements, infrastructure, and institutional reforms. The United States was a driving force behind the creation of IDA in 1960 and remains its largest shareholder. The United States currently supports IDA through appropriated contributions pledged to IDA’s 16th replenishment period.⁷⁶

⁷⁵ Jan Corfee-Morlot et al., *Financing Climate Change Mitigation: Towards a Framework for Measurement, Reporting, and Verification*, Organization for Economic Cooperation and Development, October 2009. Table 1.

⁷⁶ See CRS Report R41170, *Multilateral Development Banks: Overview and Issues for Congress*, by Rebecca M. Nelson.

- b. **Tropical Forests Conservation Act:** The Tropical Forest Conservation Act authorizes debt relief for low- and middle-income countries to support conservation of tropical forests. Under the program, treated debt is reduced and redirected to provide for grants to local non-governmental organizations and other entities engaged in forest conservation in the recipient country. The United States uses appropriated funds to pay for the budget cost of the debt restructuring. “Debt-for-nature” initiatives like the TFCA may be structured as either bilateral or multilateral programs and may employ third-party non-governmental organizations as brokers or rely on direct government-to-government agency coordination. To date, the United States has concluded 17 TFCA agreements in 14 countries, generating over \$260 million for tropical forest conservation and the consequent GHG emission savings.⁷⁷
- c. **Global Environment Facility:** The Global Environment Facility (GEF) is an independent and international financial institution that provides grant-based financing to cover the additional or “incremental” costs associated with transforming projects with national development benefits into ones with global environmental benefits. GEF partners with international institutions, nongovernmental organizations, and the private sector to assist lower-income countries with environmental projects related to six areas: biodiversity, climate change, international waters, the stratospheric ozone layer, land degradation, and persistent organic pollutants. Since its inception, GEF has allocated \$9.2 billion—supplemented by more than \$40 billion in co-financing—for more than 2,700 projects in 165 countries. GEF estimates that approximately 50% of its implemented projects assist climate change activities. The United States currently supports GEF through appropriated contributions pledged to GEF’s fifth replenishment period (2010-2014).⁷⁸
- d. **Clean Technology Fund:** The Clean Technology Fund (CTF) is one of two Climate Investment Funds administered by the World Bank Group that aim to help finance lower-income countries’ transitions toward low-carbon and climate-resilient development. Implemented in 2008 by the United States, the United Kingdom, and Japan, and joined by several other donors in the international community, the CTF seeks to provide financing—principally to larger emerging economies and to regional groups—for demonstrating, deploying, and diffusing large-scale clean energy investments with the potential for long-term avoidance of GHG emissions. The fund promotes renewable energy and energy efficient technologies as well as energy efficiency strategies in the transportation, building, industry, and agricultural sectors. Eight contributing countries have pledged \$4.4 billion to the CTF since September 2008 in support of programs in 18 lower-income countries. The U.S. pledge of \$2 billion—split between the CTF and the SCF—is currently supported through annual appropriated contributions.⁷⁹
- e. **Strategic Climate Fund:** The Strategic Climate Fund (SCF), founded in conjunction with the CTF as the second of the World Bank’s two Climate Investment Funds, supports three programs that aim to pilot new and scaled-up

⁷⁷ See CRS Report RL31286, *Debt-for-Nature Initiatives and the Tropical Forest Conservation Act: Status and Implementation*, by Pervaze A. Sheikh.

⁷⁸ See CRS Report R41165, *Global Environment Facility (GEF): An Overview*, by Richard K. Lattanzio.

⁷⁹ See CRS Report R41302, *Climate Investment Funds (CIFs): An Overview*, by Richard K. Lattanzio.

approaches to address climate change challenges in lower-income countries. The Pilot Program for Climate Resilience assists many of the poorest and most vulnerable countries prepare for and respond to the impacts of climate change by integrating climate adaptation measures into core development planning. The Forest Investment Program works to reduce deforestation in lower-income countries through improved forest management. The Program for Scaling-Up Renewable Energy in Low Income Countries supports a select number of the poorest countries in their efforts to expand energy access and stimulate economic growth through the deployment of renewable energy solutions. Ten contributing countries have pledged \$2.5 billion to the SCF since September 2008 in support of programs in over 30 lower-income countries. The U.S. pledge of \$2 billion—split between the CTF and the SCF—is currently supported through annual appropriated contributions.⁸⁰

- f. **Green Climate Fund:** The Green Climate Fund, currently under negotiation in the UNFCCC Ad Hoc Working Group on Long Term Cooperative Action as set forth by the Cancun Agreements in December 2010, is to be designated as the official financial mechanism of the Convention. Upon creation, it would support projects, programs, policies, and other activities in lower-income countries using thematic funding windows for mitigation, adaptation, forestry, capacity building, and technology transfer, among others. All program attributes have yet to be agreed upon by negotiating Parties, including provisions for its trustee, governance structure, administration, funding levels, and its official status under the Convention.⁸¹

Caveats Regarding Mechanisms

The Debate between Bilateral and Multilateral: Contrasting models of foreign assistance have arisen through the years in programs like the Marshall Plan, involving bilateral aid arrangements between countries, and the Bretton Woods process, involving multilateral arrangements like the IMF, the World Bank, and others. Historically, bilateral assistance has dominated the foreign aid landscape, and it remains potentially the most direct and timely method of reaching a destination and working for a recipient government. Environmental contributions by multilateral organizations have been criticized for a lack of cost efficiency, a focus on economic development in lieu of the environment, and the imposition of requirements for global environmental benefits as opposed to local, environmentally sound development. But proponents stress that multilateral assistance tends to be less tied to the political self-interest of individual donor countries, allows for the efficient pooling of financial resources and the leveraging of additional monies, helps ensure that different bilateral arrangements do not work at cross-purposes, and serves to develop a sense of cooperation among nations with the additional advantage of reducing conflict.

The Complex Institutional Architecture: Whether it is the United Nations family of agencies, the World Bank Group, or any number of countries and their development agencies, the plethora of actors engaged in climate financing is unwieldy to many recipient countries. Larger bureaucracies tend to slow and dampen performance, reduce flexibility and transparency, and heighten transaction costs. As mechanisms for climate finance proliferate, each new or special-purpose fund carries with it a set of challenges, including redesigned institutional and governance

⁸⁰ See CRS Report R41302, *Climate Investment Funds (CIFs): An Overview*, by Richard K. Lattanzio.

⁸¹ See The UNFCCC “Cancun Agreement” at United Nations Convention on Climate Change, *Draft decision -/CP.16, Outcome of the work of the Ad Hoc Working Group on long-term Cooperative Action under the Convention*, 2010, Section IV.A. “Finance,” at http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_lca.pdf.

functions, inefficient allocations, and limitations on scaling up. These challenges threaten to reduce the overall effectiveness of climate finance because as transaction costs increase, recipient country ownership lags and alignment with country development objectives becomes more difficult.

The Limitations of Current Market Mechanisms: The UNFCCC Clean Development Mechanism has demonstrated that markets can stimulate emission reductions, provide essential learning, and build capacity. But some attest that mechanisms such as the CDM contain inherent inefficiencies, including a relatively weak and inefficient UNFCCC governance structure, an inability to successfully generate local economic co-benefits, an uneven distribution of projects that is geared toward higher-income emerging economies, a weakness in incentives to foster real transformations to a low-carbon economy, and a debate over the additionality of a given project's reductions (i.e., a debate over if the enacted emission reductions paid for by the mechanism are additional to actions that otherwise would have occurred).

The Choice between Top-Down or Bottom-Up: Whether purposeful or not, the international community is currently operating under a disjointed set of mechanisms which encourages fragmentation of the global response to climate change. Some argue that the “bottom-up” approach offers competition for market share, flexibility in international commitments, and a greater leeway to manage climate change action on individual terms, including accounting for different views of national circumstances, domestic politics, legal backgrounds, economic costs, and competitiveness exposures. The United States and other higher-income countries, as well as some emerging economies such as China, often stress the bottom-up approach as a way to protect international political issues (such as sovereign rights) and international economic issues (such as the globalization of markets). Others find fragmentation to be a great detriment to effectiveness, efficiency, and equity at a time when the international community may wish to bring together a myriad of elements into a single, functioning, strategic framework. Most lower-income countries tend to support a centralized, top-down mechanism situated in the UNFCCC, or the United Nations at large. They may perceive a heightened sense of coordination, consistency, and transparency afforded by these institutions through their “one country: one vote” paradigm.

U.S. Contributions to International Climate Change Financial Assistance

Congressional Authority, Oversight, Appropriations

The United States has relied mostly on direct budget appropriations to finance climate change actions internationally. Congress is responsible for several activities in this regard, including (1) authorizing periodic appropriations for federal agency programs and multilateral fund contributions, (2) enacting those appropriations, and (3) overseeing U.S. interests in the programs.⁸² Oversight may come in the form of guidance; please see box “Some Examples of Legislative and Executive Branch Guidance” in this section for examples. Currently, direct budget contributions from the U.S. government are appropriated to relevant federal agencies to support their bilateral and multilateral contributions to international climate change initiatives.

⁸² For more substantive analysis of foreign aid and congressional roles, see CRS Report R40213, *Foreign Aid: An Introduction to U.S. Programs and Policy*, by Curt Tarnoff and Marian Leonardo Lawson; and CRS Report R41170, *Multilateral Development Banks: Overview and Issues for Congress*, by Rebecca M. Nelson.

These appropriations are requested on an annual basis by the Administration and enacted on an annual basis by the Congress.

The majority of bilateral and multilateral contributions to international climate change initiatives is funded through programs at the Department of State, the Department of the Treasury, and the U.S. Agency for International Development.⁸³ Funds for these programs are appropriated in the Administration's Executive Budget, Function 150, for State, Foreign Operations, and Related Programs. Historical budget authority for these programs through 2009 is presented in **Table 3**. The current Administration's budget authority and budget requests are presented in **Table 4**.

Congressional committees of jurisdiction for international climate change programs at the Department of State, the Department of the Treasury, and the U.S. Agency for International Development include

- the U.S. House of Representatives Committee on Foreign Affairs, (various subcommittees);
- the U.S. House of Representatives Committee on Financial Services, Subcommittee on International Monetary Policy and Trade;
- the U.S. House of Representatives Committee on Appropriations, Subcommittee on State, Foreign Operations, and Related Programs;
- the U.S. Senate Committee on Foreign Relations, Subcommittee on International Development and Foreign Assistance, Economic Affairs, and International Environmental Protection; and
- the U.S. Senate Committee on Appropriations, Subcommittee on State, Foreign Operations, and Related Programs.

Currently, no federally legislated system exists to require or assure future, predictable public financing for international climate change assistance (e.g., a mandated allocation of redirected fossil fuel subsidies). Similarly, no federally legislated market-based mechanism has been instituted that would contribute funds generated from the private sector for international climate change assistance (e.g., a GHG cap-and-trade program, which could incentivize international private capital investment through offset markets or provide internationally targeted funds through an allocation of auction or offset revenue).

⁸³ A much smaller percentage of funding for international climate change initiatives is included in the program budgets of "complementary agencies" in the U.S. government, including the Department of Energy, the Environmental Protection Agency, the Department of Commerce, the National Science Foundation, the Department of Agriculture, the National Aeronautics and Space Administration, the Millennium Challenge Corporation, and the Trade and Development Agency. See **Table 4**, Note.

Table 3. Historical U.S Budget Authority for International Climate Change Assistance by Agency and Program

Actual Funding, in Nominal US\$ Millions

Agency/Program	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09
Department of State	1	1	1	3	3	5	7	7	7	7	6	5	8	12	41	41	55
Diplomatic and Consular Affairs															3	4	2
Economic Support Fund													1	6	32	32	24
International Organizations and Programs	1	1	1	3	3	5	7	7	7	7	6	5	7	6	6	5	29
Department of the Treasury	0	12	35	14	14	18	60	14	54	43	56	52	44	46	46	46	46
Debt Restructuring																	
Tropical Forestry Conservation Act									13	5		20	20	20	20	20	20
Global Environment Facility ^a		12	35	14	14	18	60	14	41	38	56	32	24	26	26	26	26
U.S. Agency for International Development	200	173	192	175	147	163	236	156	157	173	208	193	183	190	99	116	222
Andean Counter-drug Initiative											2	3	2				
Assistance for Eastern Europe and Baltic States							12	4	13	11	8	7	5	6	3	11	7
Assistance for the Independent States of the Former Soviet Union							35	34	31	30	48	47	34	30	5	15	8
Development Assistance	200	173	192	175	147	163	169	109	112	116	140	125	134	118	89	81	113
Development Credit Authority							1	1	1								
Economic Support Fund							19	8		12	6	9	5	33		7	94
International Disaster Assistance										4	4	2	2	2	2	2	
P.L. 480 Food Aid													1	1			
Complementary Agencies^b	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	201	186	228	192	164	186	303	177	218	223	270	250	235	248	186	203	323

Source: U.S. Government Accountability Office, *Climate Change: Federal Reports on Climate Change Funding Should be Clearer and More Complete*, GAO-05-461, August 2005; Office of Management and Budget, *Federal Climate Change Expenditures Report to Congress*, (various years).

- a. GEF funding as reported by OMB each year represents the portion of total GEF funding that is related to climate change.
- b. International climate change assistance from “complementary agencies” may range from several millions of dollars to several hundred millions of dollars annually. Complementary agencies include, for example, the Department of Energy, Environmental Protection Agency, Department of Commerce, National Science Foundation, Department of Agriculture, National Aeronautics and Space Administration, Millennium Challenge Corporation, and U.S. Trade and Development Agency, and serve to supplement core international climate assistance. OMB did not report international climate change assistance from complementary agencies until 2010.

Prior to 2010, an accounting of international climate change assistance contributed by agencies other than the core international assistance agencies (i.e., USAID, State, Treasury) can be interpreted from the various United States Action Reports, National Communication of the United States of America Under the United Nations Framework Convention on Climate Change. (See the Department of State’s website for a catalogue of these reports, at <http://www.state.gov/g/oes/rls/rpts/index.htm>.) The U.S. Action Reports to the UNFCCC describe programs, give large aggregate numbers in support of total U.S. international assistance, and define “direct U.S. support” for international climate change activities to include “official development assistance (ODA), official assistance (OA), grants from foundations and other philanthropic institutions, U.S. government backed project financing, NGO funds, foreign direct investment (FDI), and commercial sales from private industry.” Thus, for example, the Third U.S. Action Report states that total direct funding from the U.S. public and private sectors for climate change activities in developing countries for the period 1997-2000 is \$7.7 billion (p. 125), wherein total assistance from the core agencies as reported by OMB (see table above) is only \$830 million. While most of the bilateral U.S. government supported activities listed in the U.S. Action Reports are funded primarily through USAID, there are many “interagency” initiatives that contribute to international climate change assistance, including the following (as reported in the Fifth U.S. Action Report, 2010): The U.S. Country Studies Program (1994 and 2001); Group on Earth Observations; Asia-Pacific Partnership on Clean Development and Climate; Methane to Markets Partnership; International Partnership for the Hydrogen Economy; Carbon Sequestration Leadership Forum; ITER; Generation IV International Forum; Global Nuclear Energy Partnership; U.S./China Energy and Environmental Technology Center; Clean Energy Technology Export Initiative; U.S. Climate Technology Cooperation Gateway; U.S. Clean Energy Initiative; Efficient Energy for Sustainable Development; Global Village Energy Partnership; United States-Asia Environmental Partnership; International Renewable Energy Program; Climate Technology Initiative; Renewable Energy and Energy Efficiency Partnership; Partnership for Clean Indoor Air; ENERGY STAR program; eeBuildings; Collaborative Labeling and Appliance Standards Program; Integrated Environmental Strategies program; Central America Greenhouse Gas Inventory Improvement Project; among others. Specific funding levels for these programs or agency allocations are not always specified.

As outlined above, the methodology for reporting taken by the U.S. Action Reports for the UNFCCC is vastly different than the methodology presented by OMB in their reports to Congress. Interpreting funding levels as they relate to international efforts to address climate change is challenged by several reporting issues. The Government Accountability Office (GAO) Climate Change: Federal Reports on Climate Change Funding Should be Clearer and More Complete, GAO-05-461, lists some of the challenges as: (1) levels of aggregation of the budget request, (2) changes in scope of what is reported, (3) changes in accounting methods over time, (4) lack of descriptions by agencies in their budget documentation, and (5) omissions of reporting of some arguably climate-related activities in the overall program. Some reported funding changes represent differences in dollar amounts for the same activities over time. Other changes are because the scope of the climate change programs has changed, or programs have been redefined to fall under climate change initiatives. Also, methods of accounting for some activities have changed over time, introducing inconsistencies across years. Further, the activities counted as relating to climate change often are below the budget account level; and while some agencies provide adequate detail—though dispersed throughout their budget documentation—others do not mention the “climate change” relevance in their documentation of certain accounts although portions of them are included in the climate change reporting. See CRS Report RL33817, *Climate Change: Federal Program Funding and Tax Incentives*, by Jane A. Leggett, for further elaboration on this issue.

Some Examples of Legislative and Executive Branch Guidance

The United States government occasionally offers policy guidance or attaches mandates to legislation regarding international climate change assistance. Guidance may be directed toward the recipient countries, the institutions who serve to implement the projects and programs, or U.S. officials who instruct in the multilateral fora. Guidance could be issued to support low-carbon transformations in institutional energy and environmental strategies; emission abatement measurement, verification, and reporting practices; institutional fiduciary standards, procurement practices, and environmental and social safeguards; among others. Some examples of mandates in federal orders and legislation include:

- The Omnibus Appropriations Act, 2009 (P.L. 111-8), which permits up to \$10 million for the Least Developed Countries Fund, under the UNFCCC, to support grants for climate change adaptation programs. To receive the funds, the Global Environment Facility (GEF) must annually report on the criteria it uses to select programs and activities that receive funds, how funded activities meet such criteria, the extent of local involvement in these activities, the amount of funds provided, and the results achieved.
- The 2009 U.S. Department of the Treasury Guidance to MDBs for Engaging with Developing Countries on Coal-Fired Power Generation, which provides guidance to the senior management and covers a range of issues including alternatives analysis, power sector policy reform, and capacity building. The guidance is intended to be adapted by individual MDBs and incorporated into their respective operational policies, country and sector strategies, and other procedures that are related to the public or private project cycle for coal-powered generation operations.
- The International Development and Finance Act of 1989 (P.L. 101-240), which requires the U.S. executive directors of the MDBs to abstain from voting, or to vote no, on any project likely to have significant environmental impact if it has not been properly assessed, or if the assessments have not been made public at least 120 days before a vote.

Historical Contributions

U.S. participation in international negotiations for global environmental assistance stretches at least back to the 1972 United Nations Conference on the Human Environment (UNCHE), the first concerted effort by the international community to focus on the environment as a major topic of concern and attention.⁸⁴ Therein, discussions among representatives from both industrialized and lower-income countries gave rise to a compromise on a doctrine to address both environmental and developmental policy. Governments at the time agreed that (1) the environment and development are two mutually reinforcing sides of the same coin, and (2) that industrialized countries would accept the principle of “incrementality” by which they would pay some or all of the additional costs of environmental initiatives in the developing world above and beyond the basic costs of development. The relationship between the environment and development was further developed at the 1992 United Nations Conference on Environment and Development, in the document called *Agenda 21*,⁸⁵ wherein a blueprint was detailed for putting sustainable

⁸⁴ United Nations Conference on the Human Environment, *Declaration of the United Nations Conference on the Human Environment*, June 16, 1972, Principle 12, “Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate- from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.” UNCHE refers to the additional cost principal as “additionality.” This report uses “incrementality” so as not to confuse with the prior uses of the term “additionality” in the report.

⁸⁵ *Agenda 21* has 40 chapters and 115 program areas laid out over 800 pages, divided into four broad areas, including “Means of Implementation,” wherein it addresses how international and national support should be organized, including the transfer to lower-income countries of financial resources and environmentally friendly technology; building capacity through technical assistance, environmental education, and scientific information; creating better databases to bridge the data gaps between nations; and improving international environmental organizations, coordination, and legal processes. United Nations Conference on Environment and Development, *Agenda 21*, 1992, at

development into practice. *Agenda 21* also doubled the pledge by the industrial world to assist lower-income countries in poverty alleviation and environmental protection. Although *Agenda 21* was impressive in its scope and comprehensiveness, the policy was non-binding; and some observers note that “the whole enterprise [was] heavily dependent on strong leadership from major countries, adequate financing, and effective institutional arrangements for follow-up ... none of which materialized.”⁸⁶

Financial pledges were made to support climate change initiatives specifically under the 1992 United Nations Convention on Climate Change (UNFCCC). The United States, as a Party to the UNFCCC, has committed to providing financial and technical assistance to lower-income countries’ efforts in meeting their respective obligations. Historically, some of this assistance has flowed through the Global Environment Facility—the official financial mechanism of the UNFCCC—to which the United States has contributed funding since 1993. Further, at the 2009 UNFCCC Conference of Parties (COP) in Copenhagen, Denmark, and at the 2010 COP in Cancun, Mexico, the United States helped negotiate a package that included developed country pledges of an aggregated \$30 billion of “fast start” climate financing for the period 2010 to 2012 and \$100 billion annually by 2020. This funding is to come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance, and be delivered through both new and existing fund arrangements, with governance structures providing for equal representation of developed and developing countries. These negotiations are still pending and are currently non-binding. The 2011 COP is scheduled to meet during December in Durban, South Africa to further negotiations toward a potentially binding treaty. The Obama Administration has not yet specified what share of pledges it envisions the United States providing, nor a strategy for how to fulfill the long-term pledge.⁸⁷

Historically, the United States’ credibility on international climate change financing has been impaired by periodic under-funding. The United States is currently \$217 million in arrears for its assessed contributions to the Global Environment Facility (i.e., 10% of the total U.S. pledge of \$2,185 million since 1994). Also, though the Bush Administration helped establish the Clean Technology Fund in 2008 under the World Bank and pledged to help capitalize it, the U.S. Congress declined to appropriate the first U.S. payment of \$400 million requested by the Administration for FY2009, and is far short of the \$2 billion aggregated pledge the Bush Administration made for the period 2008-2012. Further, recent appropriations fall well below what many countries envisage for the U.S. share of the \$30 billion UNFCCC “fast start” pledge.⁸⁸

FY2011 Enacted Budget Authority and the FY2012 Budget Request

Based on provisions in H.R. 1473, most FY2011 enacted funding for international climate programs at the Department of State, the Department of the Treasury, and USAID (Function 150) are drawn from larger line item agency categories. Allocations for these programs are at the discretion of the agency, in relation to its other programming, and have yet to be reported.

<http://www.un.org/esa/dsd/agenda21/> (accessed March 31, 2011).

⁸⁶ James Gustave Speth and Peter Haas, *Global Environmental Governance* (Washington: Island Press, 2006), p.72.

⁸⁷ For more information on international negotiations regarding climate change, see CRS Report R40001, *A U.S.-Centric Chronology of the International Climate Change Negotiations*, by Jane A. Leggett.

⁸⁸ Although the United States declines to consider a defined percentage as an appropriate means to share the pledged financing, past responsibilities in similar international fora suggest to some that the United States might provide between 20%-30% of the amount, or \$6 billion-\$10 billion over three years.

The Obama Administration's FY2012 budget request for international climate programs at the Department of State, the Department of the Treasury, and USAID (Function 150) would fund near-term climate financing of slightly over \$1.3 billion across three areas: (1) clean energy⁸⁹ (\$652 million, up from \$531 million enacted for FY2010) to reduce net GHG emissions from the energy sector, industry, and urban areas; (2) sustainable landscapes⁹⁰ (\$421 million, up from \$169 million enacted for FY2010) to assist reduction of GHG emissions from deforestation and land degradation; and (3) adaptation⁹¹ (\$256 million, up from \$246 million enacted for FY2010) to focus on helping countries manage climate and weather-related risks and build resilience.

Table 4 outlines recent U.S. budget authority and Administration requests for international climate change assistance programs by agency. For a more detailed description of the Obama Administration's Global Climate Change Initiative, its agencies, programs, funding, and purposes, please refer to **Appendix C**.

Table 4. Recent U.S Budget Authority for International Climate Change Assistance by Agency and Program (Obama Administration)

In Nominal US\$ Millions

Agency/Program	2010 Enacted	2011 Request	2011 Enacted	2012 Request
Department of State	199	149	TBD^a	143
Least Developed Country Fund	30	30	TBD	30
Special Climate Change Fund	20	20	TBD	20
World Bank Forest Carbon Partnership	10	15	TBD	21
Other State Programs	139	84	TBD	72
Department of the Treasury	421	744	TBD	677
Tropical Forests Conservation Act	20	20	TBD	15
Global Environment Facility ^b	26	89	46	72
Clean Technology Fund	300	400	185	400
Strategic Climate Fund: Pilot Program for Climate Resilience	55	90	/50 ^c	40
Strategic Climate Fund: Forest Investment Program	20	95	/50	130
Strategic Climate Fund: Scaling-Up Renewable Energy	0	50	/50	20
U.S. Agency for International Development	383	491	TBD	509
Bilateral and Regional Programs	383	491	TBD	509
Complementary Agencies^d	77	110	TBD	TBD
Total	1080	1494	TBD	TBD

⁸⁹ "Clean Energy" programming defined as mitigating net greenhouse gas emissions from energy sectors using energy efficiency and low-emission technologies.

⁹⁰ "Sustainable Landscapes" programming defined as reducing greenhouse gas emissions from deforestation and land degradation.

⁹¹ "Adaptation" programming is defined as assisting countries manage climate and weather-related risks and build climate resilience.

Source: Office of Management and Budget, *Federal Climate Change Expenditures Report to Congress*, 2010; Office of Management and Budget, *The Budget of the United States Government*, 2011 and 2012 (State, Foreign Operations, and Related Programs Budget). H.R. 1473, the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10).

- a. TBD, “to be determined”: Appropriated funds for these specific programs/activities are drawn from larger line item categories in agency budget authorities, occasionally with “shall”-language implementing spending ceilings. Based on provisions in H.R. 1473, allocations in FY2011 for these programs are left at the discretion of the agency and have yet to be determined/reported.
- b. GEF funding as reported by OMB each year represents the portion of total GEF funding that is related to climate change. Total GEF request across all environmental sectors is FY2010 en. \$87million, FY2011 req. \$175million, FY2011 en. \$90million, FY2012 req. \$144 million.
- c. H.R. 1473, The Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10), FY2011 budget authority for the Strategic Climate Fund is \$50million for all programming. Allocation of funds among the three sub-programs is at the discretion of Treasury and has yet to be determined/reported.
- d. Budget authority is for foreign assistance “core agencies (i.e., the Department of State, the Department of the Treasury, and the U.S. Agency for International Development) as presented in the State, Foreign Operations, and Related Programs account. Additional funds have been identified in the Administration’s budget proposals for other “complementary” agencies, including the Department of Energy, Environmental Protection Agency, Department of Commerce, National Science Foundation, Department of Agriculture, National Aeronautics and Space Administration, Millennium Challenge Corporation, and U.S. Trade and Development Agency, to supplement core international climate assistance.

Appendix A. Glossary of Options for Generating and Disbursing Financing to Address Climate Change

Table A-1. Glossary of Finance Options

Explanations Are Neither Comprehensive nor Definitive of the Many Proposals That Exist

Fund Generation Mechanisms	
Private Compliance Market	Private sales and purchases of emission allowances, or credits for emission reductions, as under many Cap-and-Trade schemes, the Clean Development Mechanism of the UNFCCC, and other proposals.
Government Compliance Market	Purchases of emission reduction credits by governments from private entities or governments, such as through Joint Implementation under the Kyoto Protocol. Some European governments appropriate funds to acquire such credits, to be applied to meet the national Greenhouse Gas (GHG) target.
National Auctioning of Allowances	Designating for international finance a percentage of the proceeds of governmental auctioning emission allowances under national (or sub-national) emission control systems, including Cap-and-Trade.
Levy on Certified Emissions Reductions	A share of any certified emission reductions might be collected, to be sold or auctioned to generate revenues. Alternatively, a fee could be levied on issuance of certified emission reductions, proportionate to the quantity or at a fixed transaction cost.
Share of Proceeds on Emissions or Offset Trading	Collection of a percentage of the funding associated with sales of traded emission allowances or certified emission reductions (offsets), as part of registering the trade. This could happen in a domestic or international program.
Emissions Fees (Carbon Tax)	A fee levied on each unit of GHG emissions from sources.
Public Appropriations	Appropriations of funds for international finance (i.e., drawing on general purpose government revenues from income taxes, etc.).
International Auctioning of Allowances	Emission allowances or offsets from national programs could be transferred to an international or inter-governmental entity, which could then auction them internationally to generate funds.
Levy on Surplus or Banked Allowances	A fee on the transfer of unused allowances from one compliance period into a later one.
International Emissions Allowances, with or without Trading, on Aviation and/or Maritime Transport	An international entity would be authorized to allocate or sell emissions permits to emission sources that are easily mobile across national boundaries, such as aviation and marine transport. This could be through an intergovernmental agreement among sovereign nations, not necessarily delegating any “governance” authority.
International Levy on Aviation or Marine Bunker Fuels	A tax could be levied on fuel use of emission-related entities, such as aviation bunker fuels or marine bunker fuels. This is very close to an emissions fee but may not be strictly proportionate to GHG emissions.
Levy on International Aviation and Maritime Transport	A tax could be levied on activities or per-use of emission-related entities, such as tickets for air travel. This is very close to an emissions fee but may not be strictly proportionate to GHG emissions.
Sovereign Wealth Funds	A publicly owned investment fund, using equity shares, bonds, or other assets (e.g., gold reserves).

Special Drawing Rights	Financial reserves held in the International Monetary Fund or a new entity could be issued to public or private participants, possibly in exchange for equity shares in the financial institution, that could be used to raise further capital (e.g., through bond sales) or to disburse as climate financing.
Debt Swap Programs	A country or financial institution holding debt from another country (or conceivably a private entity holding debt) could agree to “swap” that debt (in lieu of repayment) for performing specified actions to mitigate or adapt to climate change, as in Debt- for-Forest Swaps.
Climate Bonds	An entity could issue bonds in order to raise capital for climate-related investments. If not issued by an existing, credit-worthy entity, provisions would need to be made for reserve capital, payment of interest, and other financial requirements.
Foreign Direct Investment	Investment and ownership by entities outside of a country of productive assets, such as low emissions equipment, etc. The foreign investor could acquire shares in an enterprise in exchange for some action (e.g., emission reduction credits), participate in a joint venture, purchase land for forest plantations, etc.
Fund Disbursement Mechanisms	
National Official Development and Climate Change Assistance (bilateral or multilateral)	Typically bilateral funding as part of overseas development assistance to assist mitigation or adaptation in the context of economic development in low-income countries.
Project-level Emissions Reduction Market	Like other project financing, project developers could seek financing, including concessional financing, in return for getting emission reductions from the project certified and selling them. Initial financing or purchase of the certified emission reductions could be by the private sector, or governments, or some combination.
Program or Sectoral Emissions Reduction Market	Governments or industry associations in a country could sell offsets or certified emission reductions achieved by broad programs (e.g., tighter energy efficiency standards) or sector-wide actions (e.g., installation of carbon capture and sequestration on all powerplants).
Reverse Auction	A government or other large entity could request bids and then purchase certified emission reductions offered at the lowest cost per unit (or other criteria). Alternatively, an entity could purchase and aggregate certified emission reductions from a variety of sources and then sell them to highest-bidding private sector or governmental entities.
Grants	A transfer of cash, goods, or services for which no repayment is required. Grants can supplement other forms of financing, including leveraging of private resources.
Performance-based Grants	A transfer of cash, goods, or services for which no repayment is required, but requiring demonstration of performance (i.e., emissions reductions or forest preservation), typically before the entire transfer is made.
Concessional Debt	Transfer of funds (e.g., loans) for which repayment of the funds is required, but at lower-than-market interest rates or other favorable treatment (e.g., extended repayment periods).
Equity	Funding provided in exchange for a share of ownership of a project or entity (i.e., corporation).
Loan Guarantee	A legal commitment by one entity to take on the debt of a borrower if that borrower is unable or unwilling to repay according to the terms of the loan. Loan guarantees could be given for specific projects or for broad program or sectoral investments.

Source: Appendix A was prepared by Jane A. Leggett, Specialist in Energy and Environmental Policy, jalegget. The terms (not definitions) are modified from a list of options in Global Canopy Programme, *The Little Climate Finance Book: A Guide to Financing Options for Forests and Climate Change*, December 2009. <http://www.globalcanopy.org>; OECD, 2009.

Appendix B. Comparison of Sources of Climate Change Financing

Table B-1. Considerations Concerning Sources of Climate Change Financing

Criteria/Options	Public Funds, Bilaterally	Public Funds, Multilaterally	GHG Reduction Credit Markets	“Share of Proceeds” of GHG Markets	Other Private Investment	Philanthropic and Other Private
Magnitude likely available^a	Currently largest portion of pledged fast-start funds	Smaller share than bilateral funding, perhaps comparable to current GHG credit markets	In long run, potentially the largest trackable quantity, dependent on a policy framework that establishes a premium for GHG reductions (i.e., prices on emission reductions)	Likely a small percentage (e.g., 2%-5%) of the size of GHG markets	Potentially the largest quantity, but distinguishing from non-climate-change investment may be problematic	Possibly comparable to recent bilateral funding ^b

Criteria/Options	Public Funds, Bilaterally	Public Funds, Multilaterally	GHG Reduction Credit Markets	"Share of Proceeds" of GHG Markets	Other Private Investment	Philanthropic and Other Private
Predictability	Fair to moderate. Dependent on national appropriations processes and macro-economic conditions. May be subject to changes in priorities of budgets. Predictability may be improved by legal provisions enacted nationally to generate a flow of funds outside of annual or regular appropriations ^c	Fair to moderate, depending on pledges and prompt payment into multilateral funds. May be subject to changes in priorities of budgets of countries and multi-purpose multilateral funds	Fair to moderate. Dependent on the existence and stability of policy frameworks, energy and macro-economic markets, technological advance, competition among suppliers and purchasers, and other factors. Once legal frameworks are in place, GHG markets may be more predictable than annual governmental appropriations.	To the degree established by rules, the percentage may be highly predictable. The absolute flow of funds would be dependent on the predictability of the size of GHG reduction credit markets.	Moderate. Dependent on the existence and stability of policy frameworks, energy and macro-economic markets, technological advance, competition among suppliers and purchasers, and other factors. Once legal frameworks are in place, GHG markets may be more predictable than annual governmental appropriations.	Likely least predictable of options

Criteria/Options	Public Funds, Bilaterally	Public Funds, Multilaterally	GHG Reduction Credit Markets	"Share of Proceeds" of GHG Markets	Other Private Investment	Philanthropic and Other Private
"Additionality"	Difficult to evaluate, in most cases, because of typically variable aid flows, and no projections of baseline aid. The "strength" of mainstreaming into development priorities makes discerning additionality difficult.	Possibly the easiest to track as "additional" to past flows.	Difficult to evaluate, although detailed methods and rules have been established for evaluating baselines and projects. Demonstrating additionality makes financing more difficult and slow, and reports exist of inappropriate approvals.	As clearly additional as the GHG reductions made.	Likely difficult to discern, especially in flows of Foreign Direct Investment and where modifications to investments have been made to mitigate GHG emissions or forest destruction, or to avoid damages.	Unknown. However, there may be few incentives to misrepresent the additionality of new climate-related initiatives and grants.
Access	Typically direct access by countries and other institutions where existing partnerships and priorities exist in donor countries. Possibly difficult access for countries that are small and not high priority bilateral partners of donors.	Typically provide broader access than bilateral funding.	Dependent on ability of seekers to participate in markets (i.e., sufficient skill, stability, credit-worthiness, etc.); Likely access for GHG mitigation, but not adaptation. Requesting entity must meet any eligibility criteria and present a project that meets standards for transparency and performance.	Theoretically, open access to any government or entity that is meets eligibility criteria.	Access is greatest to private sector projects that would be profitable without or with further public incentives (e.g., a price on carbon or a renewable energy quota). Access is unlikely for adaptation projects, small projects, and projects without reliable revenue flows, and proponents with poor access to credit.	Unknown. Access is likely best for larger projects managed by well established entities with a proven record of positive performance. Some philanthropic organizations, however, specialize in higher risk projects and micro-finance. Public and private funds may diminish philanthropic contributions.

Criteria/Options	Public Funds, Bilaterally	Public Funds, Multilaterally	GHG Reduction Credit Markets	"Share of Proceeds" of GHG Markets	Other Private Investment	Philanthropic and Other Private
Transparency	Poor to moderate. Dependent on availability of public reports on details of funding. Poor transparency of performance on funded projects and programs.	High, because of public reporting and review requirements.	High, because of public reporting and review requirements.	Highest because of clear share of proceeds from emission reduction credit markets.	Poor to fair, as there is unlikely to be a requirement for reporting publicly such flows in detail and with verification.	Poor to moderate, as there is unlikely to be a requirement for reporting publicly such flows in detail and with verification.
Fiduciary Standards	Unclear. Dependent on practices of donor and recipient entities, and of willingness to report in detail to public.	Moderate and improving.	Theoretically high, but expensive and time-consuming to ensure. Some limited reports of fraud in existing markets. Will depend on efficacy of project performance verification as well.	Depends on the requirements of the project review, disbursement, and accountability mechanism.	Presumably high, as private investors have incentives to set high standards.	Varies with the requirements of each philanthropic organization.
Efficiency	Easiest to "mainstream" into development priorities.	Possibly least efficient the more centralized the review and disbursement mechanism.	Financing is directly tied to mitigation performance. Theoretically the most efficient, but realistically dependent on the absence of failures or inefficiencies, such as existing externalities, lack of information, unequal access.	Possibly least efficient the more centralized the review and disbursement mechanism, and the greater the requirements for project proposal, review, and verification.	Theoretically efficient. If transaction costs rise too high, the investment becomes unprofitable and funds flow to more efficient investment. Efficiency would be compromised if actual project climate-related performance is poor.	Varies with the requirements of each philanthropic organization. Likely more efficient than large, public funds with public review and decision-making processes.

Source: Appendix B was prepared by Jane A. Leggett, Specialist in Energy and Environmental Policy, jalegett.

- a. The judgments in this table about the likely magnitudes of funding are based, in part, on analyses of past flows, pledges, and theoretical analyses of the potentials (based also on historical evidence). See, for example, Jan Corfee-Morlot, Bruno Guay, and Kate M. Larsen, *Financing Climate Change Mitigation: Towards a Framework for Measurement, Reporting and Verification* (Paris: Organisation for Economic Cooperation and Development, October 2009), <http://www.oecd.org/dataoecd/0/60/44019962.pdf>.
- b. Although compilations are not available of philanthropic support to address climate change, the magnitude is likely in the billions of dollars, based on press reports. See, for example: <http://philanthropy.com/article/Grant-Makers-Pour-More-Than/56848/>; <http://philanthropy.com/article/Rockefeller-Commits/62676/>; <http://philanthropy.com/article/Doris-Duke-Foundation-Gives/54670/>; <http://philanthropy.com/article/Soros-Pledges-100-Million-/57718/>; etc.
- c. Consideration of mechanisms to assure funding through public institutions has occurred in a number of fora, and has been enacted by the European Commission. In the United States, several legislative proposals (e.g., H.R. 2454, the American Clean Energy and Security Act passed by the House in June 2010) would allocate a portion of revenues generated by the bill to international financing. Whether such revenues would be subject to further appropriation is often controversial. Internationally, a high-level panel convened by United Nations Secretary General Ban Ki-Moon is studying proposals for levies on international bunker fuels, redirection of fossil fuel subsidies, etc. that willing countries might enact to generate a relatively reliable flow of funds.

Appendix C. U.S. Global Climate Change Initiative

Figure C-1. Recent U.S Budget Authority and Requests for the Obama Administration's Global Climate Change Initiative by Agency and Category

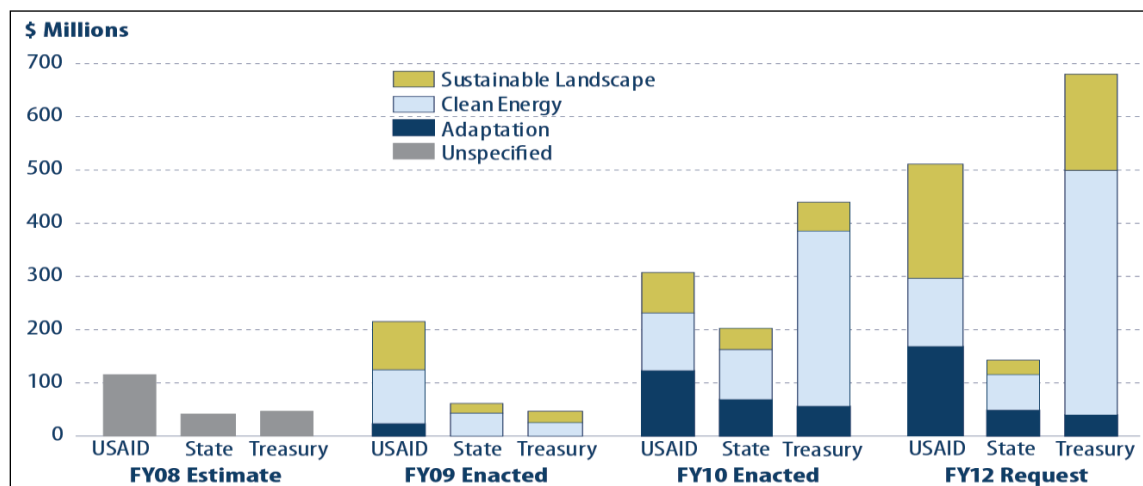


Table C-1. Recent U.S Budget Authority and Requests for the Obama Administration's Global Climate Change Initiative by Agency and Category

Assistance by Category, Agency, Year, Nominal US\$ in Millions

Category	Agency	FY2008 Estimate	FY2009 Enacted	FY2010 Enacted	FY2011 Request	FY2011 Enacted	FY2012 Request
Adaptation	USAID	\$15	\$24	\$123	\$187	TBD	\$167
	State	0	0	68	57	TBD	49
	Treasury	0	0	55	90	TBD	40
Energy	USAID	50	100	108	129	TBD	129
	State	31	43	94	74	TBD	66
	Treasury	26	26	329	508	TBD	457
Landscapes	USAID	50	90	75	175	TBD	213
	State	10	18	40	25	TBD	28
	Treasury	20	20	54	147	TBD	180
Total		202	321	946	1,391	TBD	1,329

Source: OMB, *Federal Climate Change Expenditures Report to Congress* 2007, 2010; *Budget of the USG*, 2011, 2012.

Notes: Figures represent annual budget authority for the Department of State, the Department of Treasury, and the U.S. Agency for International Development through appropriations by the U.S. House and Senate Subcommittees on State, Foreign Operations & Related Programs. There were no "Federal Climate Change Expenditures Report to Congress" in 2008 and 2009; the FY2008 figure is an estimate from the 2007 report. Funding was unspecified by category in FY2008; the FY2008 category figures are CRS approximations. For FY2011, allocations by category have not yet been reported by agencies based on enacted appropriations in H.R. 1473 (P.L. 112-10). Budget authority listed above does not include international programs in complementary agencies (e.g., DOE, EPA, DOC, NSF, USDA, NASA, MCC, TDA).

“Adaptation” (\$256 million FY2012 request, up from \$246 million in FY2010)

Assisting countries manage climate and weather-related risks and build climate resilience.

- Bilateral and regional programs: FY2012 req. \$167 million, USAID (FY2011 req. \$187m; FY2010 en. \$123m): U.S. investments that target the more vulnerable countries in Africa, Asia, and Latin America and address climate risks in areas including infrastructure, agriculture, health and water services. They aim to develop capacity for countries to use the best science and analysis for decision making, and promote sound governance to carry out these decisions.
- Least Developed Country Fund, Special Climate Change Fund, and other activities: FY2012 req. \$49 million, State (FY2011 req. \$57m; FY2010 en. \$68m): Multilateral funds that focus on climate resilience and food security provisions in the countries with greatest needs.
- Pilot Program for Climate Resilience: FY2012 req. \$40 million, Treasury (FY2011 req. \$90m; FY2010 en. \$55m): A multilateral pilot program that coordinates comprehensive strategies in nine of the poorest and most vulnerable countries to support actions that respond to climate risks.

“Clean Energy” (\$652 million FY2012 request, up from \$531 million in FY2010)

Mitigating net greenhouse gas emissions from energy sectors using energy efficiency and low-emission technologies.

- Clean Technology Fund: FY2012 req. \$400 million, Treasury (FY2011 req. \$400m; FY2010 en. \$300m): Multilateral program that aims to spur large-scale clean energy investments in lower-income countries with rapidly growing emissions.
- Bilateral and regional programs: FY2012 req. \$129 million, USAID (FY2011 req. \$129m; FY2010 en. \$108m): U.S. investments for energy sector reform, energy efficiency, clean transport, and low-carbon energy use that support Low Emission Development Strategies and focus on countries that have strong emission reduction potential and a commitment to the principle of low-emissions growth.
- Global Environment Facility: FY2012 req. \$37 million, Treasury (FY2011 req. \$58m; FY2010 en. \$26m) Multilateral financial institution that provides incremental funding for projects that provide global environmental benefits. 26% of GEF's activities promote the demonstration, deployment, and transfer of innovative, low-carbon technologies. Total GEF request across all environmental sectors: FY2012 req. \$144 million, Treasury (FY2011 req. \$175m; FY2010 en. \$87m).
- Program for Scaling-Up Renewable Energy in Low Income Countries: FY2012 req. \$20 million, Treasury (FY2011 req. \$50m; FY2010 en. \$0m). Multilateral program that assists the poorest countries expand energy access and stimulate economic growth through the scaled-up deployment of clean and secure renewable energy strategies.

“Sustainable Landscapes” (\$421 million FY2012 request, up from \$169 million)

Reducing greenhouse gas emissions from deforestation and land degradation.

- **Bilateral and regional programs:** FY2012 req. \$213 million, USAID (FY2011 req. \$175m; FY2010 en. \$75m): U.S. investments that support country-driven policies for forest governance, forest cover and land use change monitoring systems, law-based resource management and land tenure, and on-the-ground efforts to halt deforestation and foster sustainable forest-based livelihoods. The program focuses on globally prominent forests in Africa, Asia, and Americas.
- **Forest Investment Program:** FY2012 req. \$130 million, Treasury (FY2011 req. \$95m; FY2010 en. \$20m): Multilateral pilot program that addresses the circumstances that lead to deforestation and increased greenhouse gas emissions in select lower-income countries. It aims to improve regulation and enforcement, mobilize private financing, and secure the social and economic benefits of sound forest management.
- **Global Environment Facility:** FY2012 req. \$35 million, Treasury (FY2011 req. \$32m; FY2010 en. \$0m): Multilateral financial institution that provides incremental funding for projects that provide global environmental benefits. Sustainable forest management funding supports projects that protect biodiversity and sustainable land use. Total GEF request across all environmental sectors: FY2012 req. \$144 million, Treasury (FY2011 req. \$175m; FY2010 en. \$87m).

Author Information

Richard K. Lattanzio
Analyst in Environmental Policy

Jane A. Leggett
Specialist in Energy and Environmental Policy

Disclaimer

This document was prepared by the Congressional Research Service (CRS). CRS serves as nonpartisan shared staff to congressional committees and Members of Congress. It operates solely at the behest of and under the direction of Congress. Information in a CRS Report should not be relied upon for purposes other than public understanding of information that has been provided by CRS to Members of Congress in connection with CRS's institutional role. CRS Reports, as a work of the United States Government, are not subject to copyright protection in the United States. Any CRS Report may be reproduced and distributed in its entirety without permission from CRS. However, as a CRS Report may include copyrighted images or material from a third party, you may need to obtain the permission of the copyright holder if you wish to copy or otherwise use copyrighted material.